IGHT, NOVEMBER 26th, 1936 FIRST AERO WEEKLY IN THE WORLD REGD. AT THE G.P.O. AS A NEWSPAPER

DEC 8 - 1936

FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

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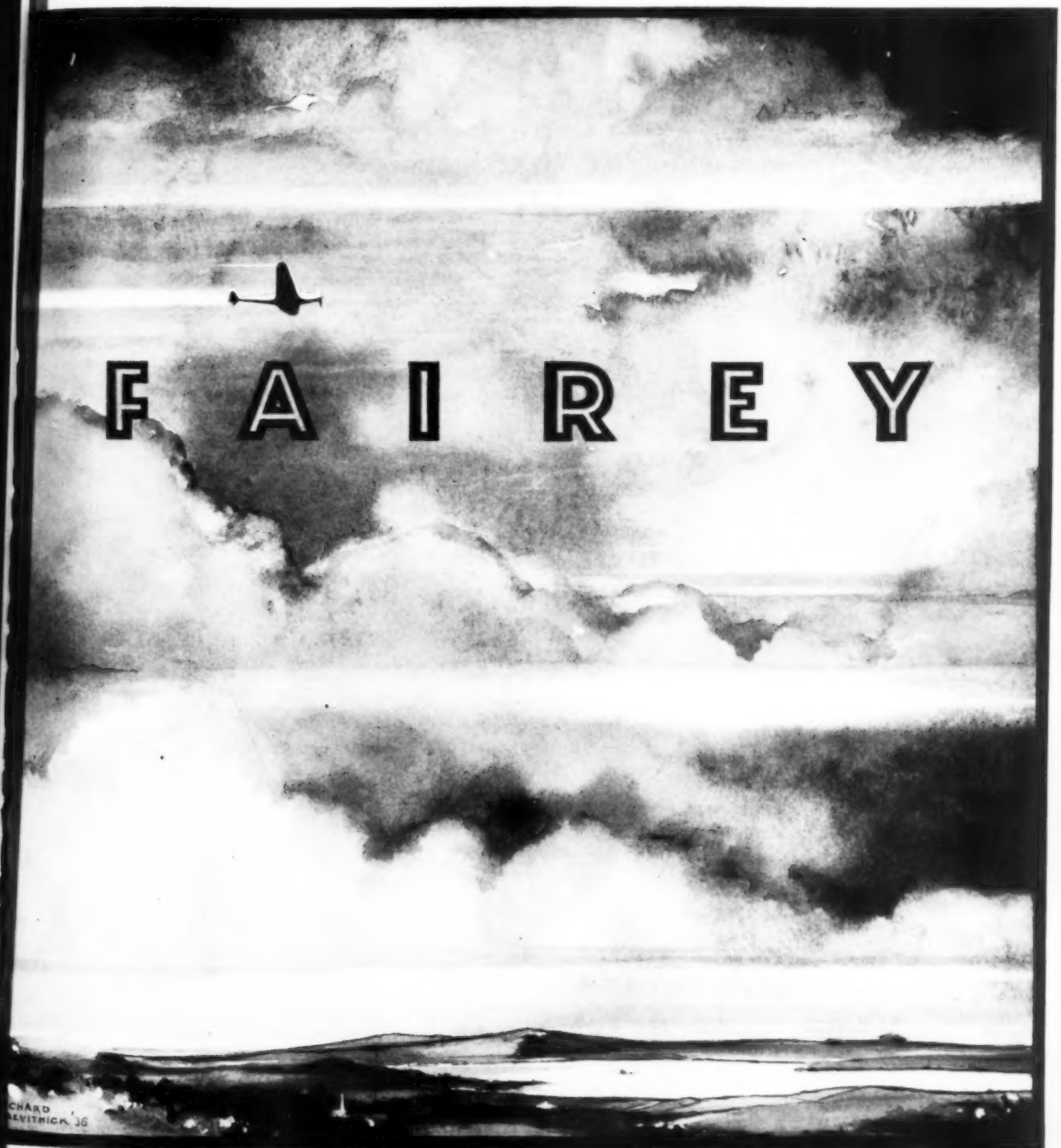

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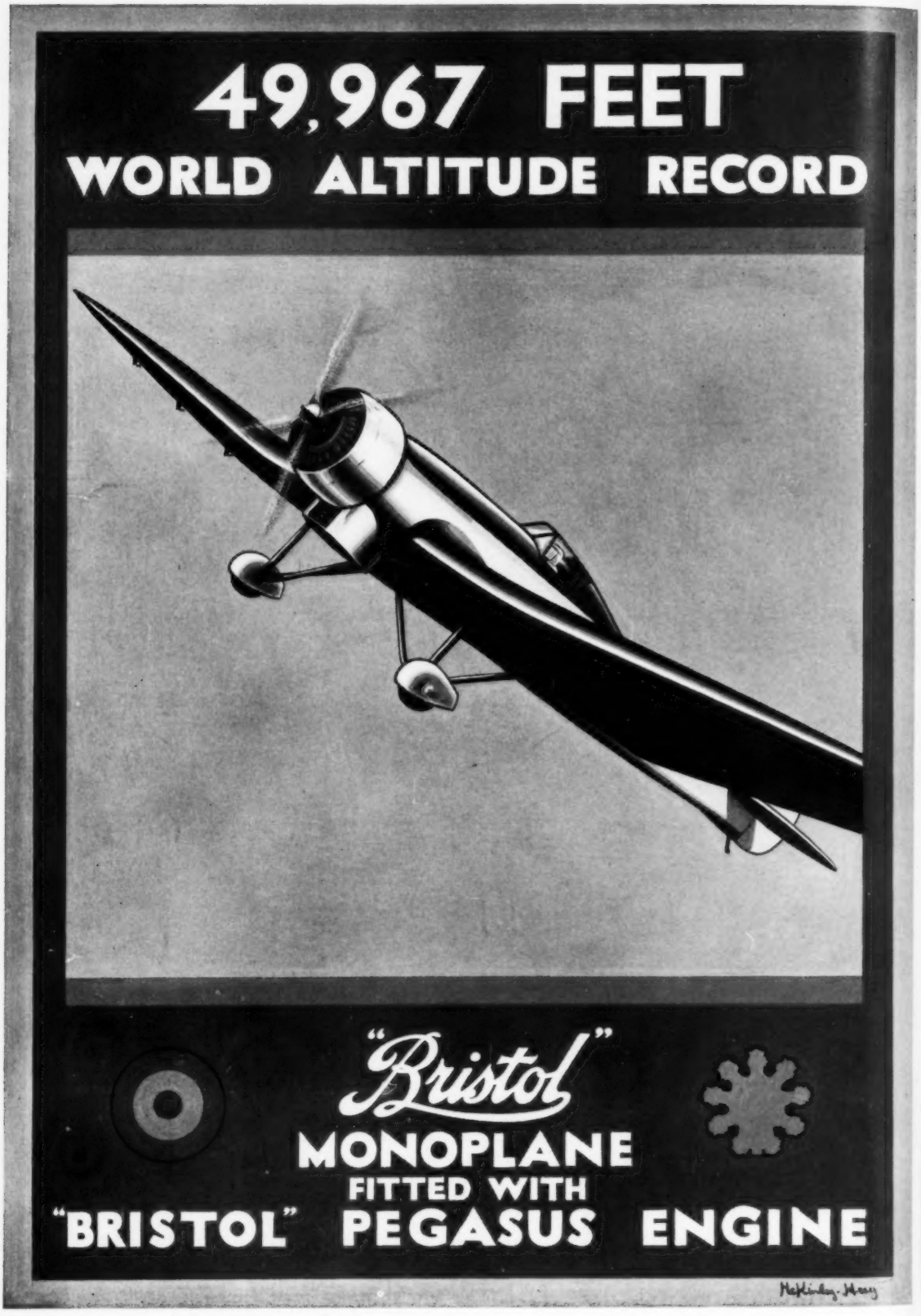

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Organised Safety

SAD though it may be to admit it, the development of specialised navigational aids and the consequent increase in the amount of bad weather flying can only have been expected to produce a temporarily increased number of minor and major accidents. Such is the price of progress in high-speed transport.

Nevertheless, there have, during the past year, been far too many of them for the mental comfort either of prospective passengers or pilots. In this country, on the Continent and in the United States a number have been caused by over-confidence or have been the direct result of incorrectly translated information. Machines have been brought down through a low ceiling or in bad visibility over ground which was a good deal higher than expected. The pilots were, in fact, not at all where they had estimated themselves to be. Disregarding the most recent accident in this country, on which an enquiry has not yet been held, this occurred in the case of the American T.W.A. machine at Fairchance last April, to the D.L.H. machine quite recently, and to the Sabena machine at Tatsfield—to quote only three cases.

We know that direction-finding is not always accurate, that every human being can make a simple mistake, particularly in moments of considerable stress, and that, even to-day, radio equipment occasionally fails completely. Obviously, therefore, there must be definite duplication of all sources of information.

Safety, in fact, must be organised. No single piece of equipment and no single calculation should be exclusively depended upon. If all major airports and all transport machines were fully and similarly equipped, the sequence would be comparatively simple.

The pilot would reach the vicinity of his destination on D/F and D/R—one supplementing the other. There he would switch on his short-wave approach receiver. If his medium-wave equipment failed, dead reckoning would always bring him within range of the short-wave transmitter, signals from which can be received twenty miles or more from the terminal. In no circumstances would he start to lose height until he had passed the first marker beacon.

If his short-wave receiver failed he would be no worse off than the newspaper pilots have been, during the past two years or more, on their approaches into Le Bourget. D/F, a sensitive altimeter, and an absolute knowledge of the safe approach line would have to suffice. In any case, since the eye itself is the final arbiter, a special beacon or ground strip should be installed at every airport. This ground strip might be illuminated in the manner of the vibratory light beacon described in *Flight* of October 15.

Whatever system or sequence is standardised, it is certain that no single method can ever stand by itself. Direction-finding, approach systems and final visual aids must be entirely complementary—the duty of each overlapping that of the others.

Dual Control

THE War Office has recently persuaded a number of R.A., R.E., and infantry units of the Territorial Army in the Midlands to accept conversion into searchlight battalions and anti-aircraft artillery brigades.

The move is to be welcomed, but at the same time it is disconcerting to read of the poor state of recruiting for the Territorial Army, and naturally there must be some doubt as to whether recruits will come forward more readily for the anti-aircraft units than they did before the conversion. To stimulate recruiting is partly a matter of offering attractive prospects and partly a psychological affair. There is no lack of patriotism in the country, for the Navy and the Air Force (both Regular and Auxiliary) are getting as many recruits as they want. It is only the Regular Army and the Territorial Army which fail to attract. The suspicion is bound

to arise that the manhood of the country looks on the War Office as a bad master, but is eager to serve the Air Ministry. If so, it would follow that service in the anti-aircraft units would become very much more attractive if they were under the Air Ministry.

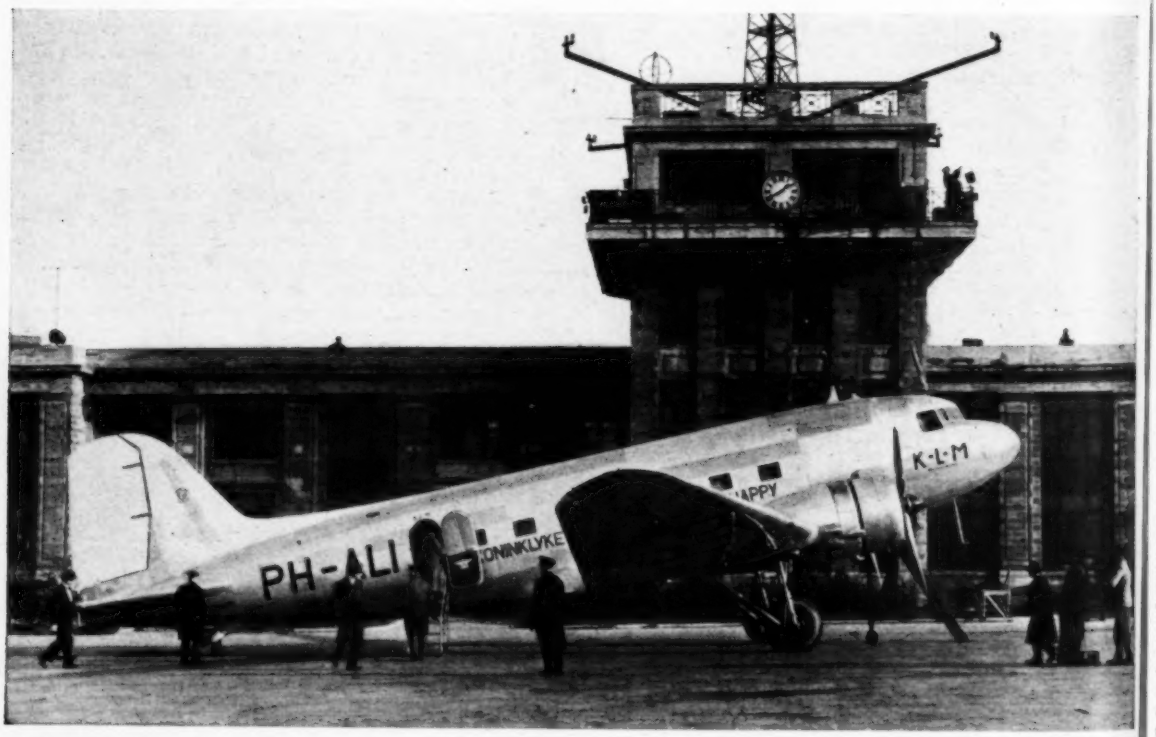
There are many other reasons for making such a change besides the probable psychological effect on recruiting, and they have frequently been stated in *Flight*. Dual control in any fighting service or organisation is always a very bad thing. All sections of naval defence ought, as we urged in our leading article last week, to be under the Admiralty, and all sections of air defence ought to be under the Air Ministry. Whether the section in question walks or floats or flies is of very minor concern. The really important matter is the class of defence of which it forms a part. To urge that because the gun and searchlights remain on the ground therefore they must belong to the War Office is a childish way of playing with defence questions. The work which the anti-aircraft units have to do is without any doubt part of air defence, and air defence, like naval defence and land defence, ought to be self-contained.

Brothers-in-Arms

Under present arrangements, the searchlight beam which illuminates a raiding bomber is directed by a soldier. The fighter which comes up to shoot the raider down is flown by an airman. The collaboration between the two needs to be the closest possible. They are engaged exclusively on the dreadfully important task of defending Britain from air attack. The work of each is absolutely dependent on the work of the other. Without the guiding beam the fighter pilot patrols in vain. Without the fighter to press the trigger the sapper might as well save his electrical current. Could brothership in arms be closer? Yet the two men belong to two separate Services, wear different uniforms, and depend for reward or punishment on two different Ministries.

During the present stress of rearmament there is little doubt that the War Office is pushing on as hard as may be with the provision of the best guns, lights, and other equipment for the anti-aircraft units. Yet everybody knows that a short time ago, when there was no tension in Europe, the War Office left the gunners and sappers with old and almost useless equipment, sometimes of wartime vintage. That may happen again, when the Cabinet ceases to regard rearmament as the most urgent need of the day. In fact, it is rather hard on the Army in general, short as it is of tanks and other needs, that so much of the War Estimates money should have to be spent on units which the Army does not control in war or on manœuvres. The cost ought to be borne on the Air Estimates. Then the whole responsibility for Air Defence would rest on the one pair of shoulders, and if there was a breakdown the public would know whose head to demand.

Under the present dual control if an enemy raid did much damage it would be possible for the Air Ministry to say that the War Office was to blame for not having kept the gunners and searchlight crews up to concert pitch. The air authorities might point out that no Territorial camps had been held at the time when they arranged for air exercises. The War Office might reply that it was no use for their men to spot the raiders if the R.A.F. could not deal with them. And so on *ad infinitum*. There is no end to the acrimony, let alone the material damage, which can result from dual control in war.



MODERN TRANSPORT : K.L.M.'s first D.C.3 at Croydon last Saturday. So far as this view is concerned the only really noticeable difference between this machine and its predecessor is in the fin form. The fin now extends along the fuselage in order to give better directional stability. (*Flight* photograph.)

The Outlook

A Running Commentary on Air Topics

The King and the R.Ae.C.

IT is announced that H.M. the King has been graciously pleased to grant his patronage to the Royal Aero Club. It is an act which will be much appreciated, not only because the new patron is the sovereign of the land but because he is also one of the most indefatigable of users of private aircraft.

The King's informal patronage of the flying movement has done a very great deal to help on the cause of the air, and this honour done to the club which rules air sport and deals with other air interests is in keeping with His Majesty's regular conduct.

Mythical No More

LAST week's big event at the Paris Show was the arrival of the new Bristol two-row, sleeve-valve radial, the name of which is a State secret withheld from everyone except the compilers of the catalogue, foreign aero-engine builders and the British Industry at large.

It is a matter of extreme difficulty to get information on this model, at least on the Bristol stand, and one must walk quite thirty yards in order to obtain data.

But, farcical as are the circumstances of its exhibition, the Hercules is an engine of extraordinary technical importance.

The multi-row air-cooled engine is a class which seems destined for big things, but which threatens, if developed along conventional lines, to become unconscionably intricate. The amazing simplicity of the Hercules, as compared with some of the "1,000 h.p. plus" units at Paris, seems to indicate that although Bristols have, of necessity, been "keeping it dark," they have a running start over their Continental rivals. Pictures will be found on pages 573 and 580*f*.

Health of the R.A.F.

IT is interesting to learn from the *Report on the Health of the Royal Air Force* for the year 1935 (price 2s. at H.M. Stationery Office) that during last year 20,431 men offered themselves for enlistment as airmen. That shows how popular the R.A.F. is. But its physical standards are very high, and of that total only 54.4 per cent. were found fit for general service. Satisfaction at the popularity of the Service is not seriously shaken by the fact that of the 11,120 men passed by the medical officers, 1,624 did not go on to a recruiting depot. They had obtained a very thorough medical examination free of cost, and were apparently well content with that.

During the year the earthquake at Quetta caused the deaths of one officer and fifty-one airmen, and a further number had to be invalided from India to the United Kingdom. This one disaster swelled the casualty figures in an abnormal way. Other injuries accounted for the deaths of twenty-seven officers, one flight cadet, two aircraft apprentices, and ninety-six airmen. Of these, twenty-two officers, one flight cadet, and seventeen airmen were killed by flying accidents on duty. One officer and one airman died of wounds received in action. Thirteen airmen lost their lives from motor and motor cycle accidents and two from pedal cycle crashes. On this year's record airmen found the road almost as dangerous as the air. Others have found it more so.

Taking all sickness together, the health of the R.A.F. was distinctly better in 1935 than it had ever been before.

From Tigris to Euphrates

FOR some years past work has been going on at Dhibban on the Euphrates to make a large R.A.F. station and aerodrome, and at last things have progressed so far that one squadron has now taken up its permanent residence there. The squadron in question is No. 30 (Bomber) Squadron from Mosul, a town on the upper reaches of the River Tigris under the hills of Kurdistan. Mosul is on, or near, the site of the ancient city of Nineveh. It will be remembered that Jonah was ordered to reprove the sins of Nineveh, and it is interesting and suggestive to know that in a gorge not far from Mosul there is a cave in the rocks known as "Whale's Mouth." In due course the R.A.F. station at Hinaidi outside Baghdad will be completely evacuated by the R.A.F., and all the squadrons will be moved to Dhibban. That a start has been made by moving the only squadron previously stationed at Mosul suggests that the hill tribes on the northern frontier of Iraq are now in a satisfactory condition of good behaviour. Probably a unit of the Iraqi flying corps will take over the permanent watch and ward over the Kurdish tribes.

The move from Hinaidi to Dhibban is a consequence of an agreement with the Iraq Government, as the latter, while appreciating the value of R.A.F. backing in emergencies, did not care to see a large R.A.F. garrison just outside the capital of the country. It is said, however, that the British personnel will score by the change, as Dhibban is a much healthier site than Hinaidi. Let us hope that they will not too much regret the fleshpots of Baghdad. Even in Great Britain there are station C.O.s who maintain that the spirit of the station and the health of the men are better when there is no large town within easy range.

M.C. and D.F.C.

A FEW years ago a gallant military officer who is a member of the House of Commons discovered to his dismay that the R.A.F. maintains armoured cars in Palestine, and expressed his indignation that these were not supplied by the War Office. Complicated and illogical procedure seems to have a particular attraction for a certain type of mind, the sort of mind which decreed that the War Office should supply the ground elements of air defence of Great Britain. Of course, those protests achieved nothing.

This incident is recalled by the awards granted by the King for gallant service during the recent disturbances in Palestine, which were recorded on page 557 of our last issue. Two officers of No. 6 (Bomber) Squadron have received the Distinguished Flying Cross, while three officers of No. 2 Armoured Car Company have been decorated with the Military Cross. The latter is an Army decoration, and to give it to R.A.F. officers seems anomalous. As they fought on the ground, presumably the D.F.C. was thought inappropriate. If that is the explanation, it is also anomalous that medical and dental officers should be termed "pilot officer" or "flying officer." Moreover, it also seems anomalous that the Air Force Cross should be given to civil pilots who make outstanding flights. The late H. G. Hawker and his navigator, Mackenzie Grieve, were the first non-Service pilots to receive the A.F.C., and it was stated at the time that King George had insisted on that award. If so, there is the best authority for the practice. The King can do no wrong.

PRACTICAL POINTS from PARIS

The Salon Through the Eyes of a Pilot : Some Instrumental and Other Tendencies

By "INDICATOR"

AFTER making his bow—with perhaps the courtliness of implied irony—to the skill and energy which has been devoted to the design and manufacture of the preponderantly numerous military craft, the purely utilitarian visitor to the Paris Exhibition would probably come away with three major impressions.

The first would be one of regret that the all-round forward view provided for pilots of military machines should be so very much better than that offered to the pilots of civil or transport machines; the second would be that the very neat grouping of instruments to be seen often failed in the object of making them any more easily read than the haphazard, but much less complicated, groupings tolerated in this country; and the third, that very inadequate prominence had been given to modern methods of navigation—particularly in the all-important field of radio, without which air transport would be as extinct as the originally clumsy Dodo.

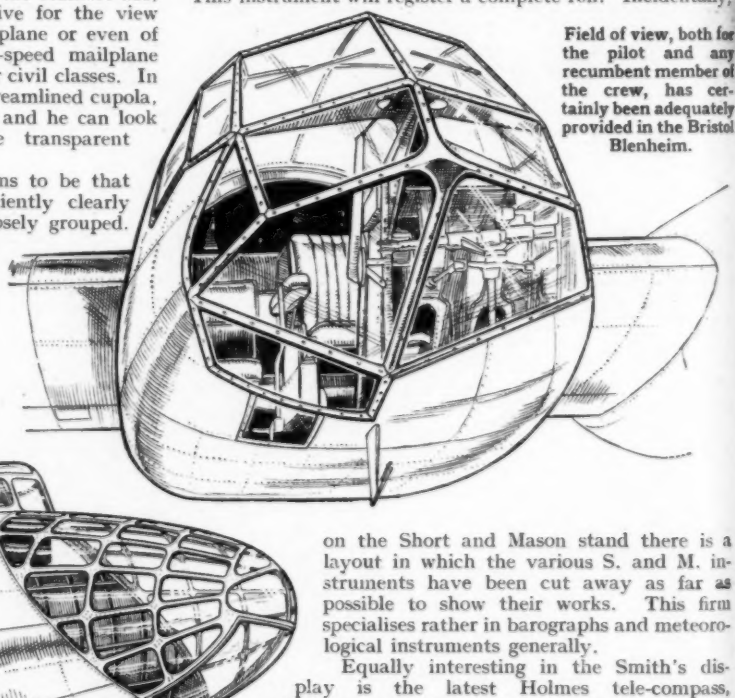
Essential View

What would transport pilots give for the sort of view-field provided in the Bristol Blenheim or the Hanriot 220, and what would single-engined pilots give for the view provided in the Koolhoven fighter monoplane or even of the Morane M.S.430. The Amiot high-speed mailplane was one important exception in the larger civil classes. In this case the pilot is seated in a sort of streamlined cupola, which is offset as in the Heinkel He.70, and he can look downwards and forwards through the transparent nose.

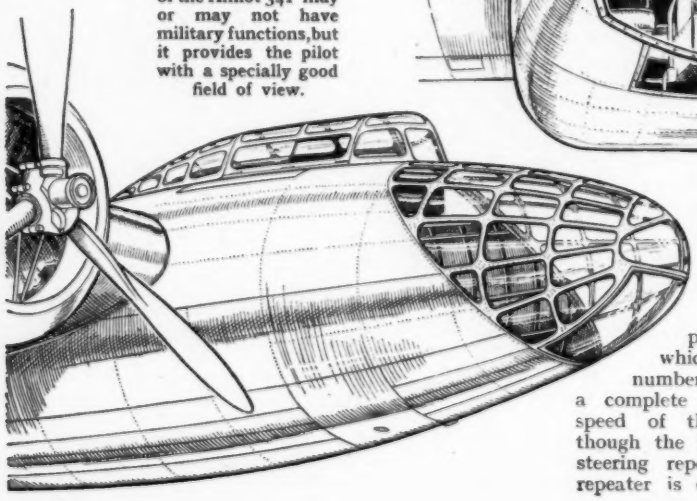
The trouble with the instruments seems to be that they are not large enough, or sufficiently clearly marked, and that they are often too closely grouped. Nevertheless, it was difficult not to admire the neatness of the blind-flying panel, of Aera manufacture, found on the majority of the more serious machines. In its standard form, this panel consists of four indicators surrounding the all-important A.S.I. On the left is a rate of climb indicator, or variometer, on the right is a simple liquid fore-and-aft level, and below is a horizontally moving turn indicator and a ball-type lateral level. Other variations on the same theme, some with Sperry horizons and gyros, were to be seen on several machines and on the very tidy Aera stand.

We are all accustomed to the use of two altimeters, one of the normal and the other of the sensitive variety, and with ultra-fast machines it may presently be customary to have two air-speed indicators. In French machines it appears to be the usual thing to have an *anemometre d'atterrissage* working, say, between 38 and 125 m.p.h., with another, for normal flight, graduated between 60 and anything up to 400 m.p.h.

The importance of the chronometer in dead-reckoning navigation cannot be overestimated, but one had to visit Smith's stand to see such an instrument built in as part of a blind-flying panel. On this stand, too, there is a panel with one of the new artificial horizons developed by Mechanism, of Croydon, and now being made by Smith's. This instrument will register a complete roll. Incidentally,



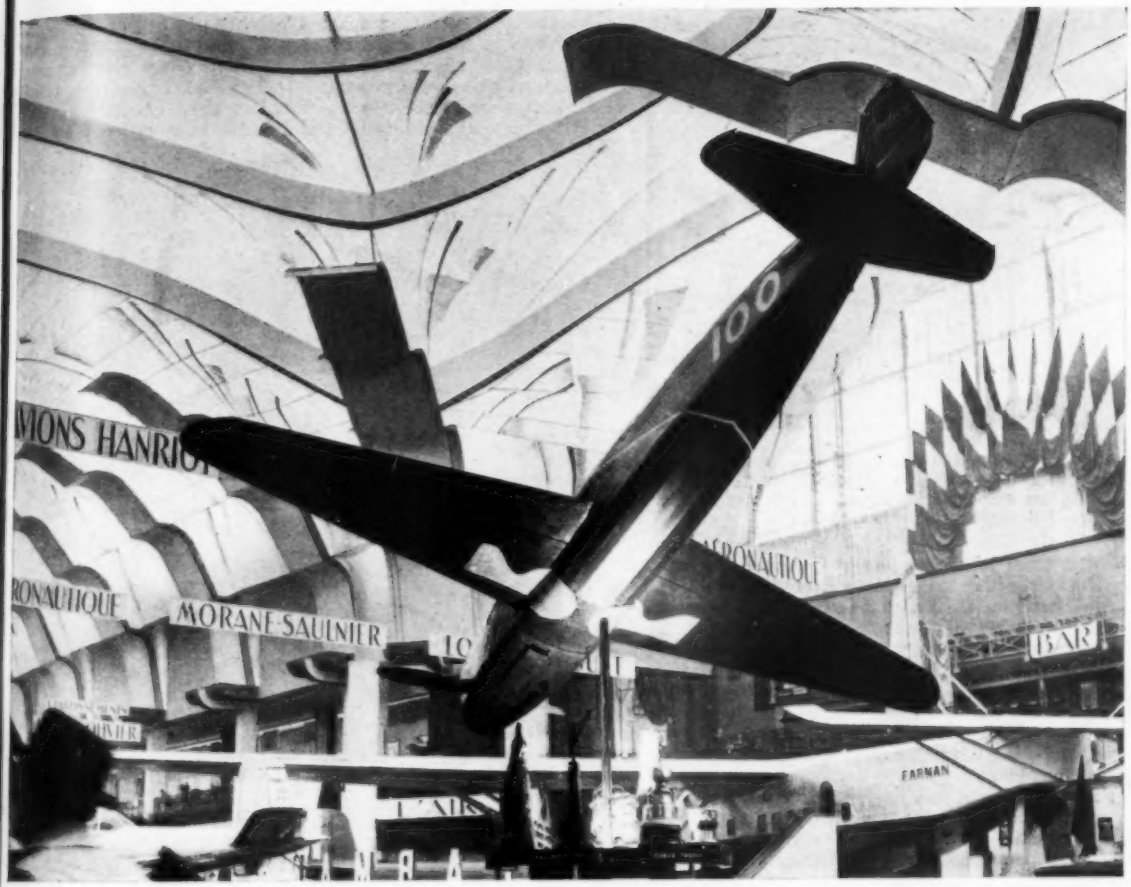
Field of view, both for the pilot and any recumbent member of the crew, has certainly been adequately provided in the Bristol Blenheim.



The transparent nose of the Amiot 341 may or may not have military functions, but it provides the pilot with a specially good field of view.

on the Short and Mason stand there is a layout in which the various S. and M. instruments have been cut away as far as possible to show their works. This firm specialises rather in barographs and meteorological instruments generally.

Equally interesting in the Smith's display is the latest Holmes tele-compass, which can be installed with any reasonable number of miniature repeater dials showing a complete 360 deg. of movement. The follow-up speed of these repeaters may be altered at will, though the usual one is about 5 deg. a second. The steering repeater is dash-mounted, while the bearing repeater is on a bracket. The former has an inner

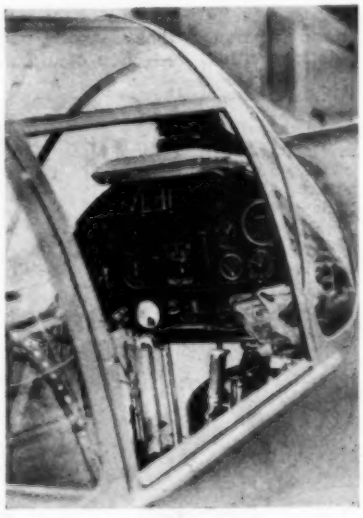


Interesting primarily as an example of the type which, in the hands of M. Detroyat, put up such a remarkable show at the U.S. National Air Races, the Caudron *Type Coupe Deutsch* strikingly illustrates a phase of the battle between sheer efficiency and practicability from the pilot's angle. (*Flight* photograph.)

micrometer dial with ten 1 deg. divisions spaced half an inch apart, while the latter has a quick-sighting azimuth circle for taking any necessary bearings. Reaching the first-class navigator's standard, there is the latest type of Booth bubble sextant for celestial observations. Incidentally, on the Jaeger stand is a mechanism which more than clearly resembles the Smith's automatic pilot; apparently the French instrument firm has obtained a licence to make this. Apart from a radio compass "hook-up" on the French Air Ministry stand, no other automatic pilots are—at least, obviously—on view.

Blind Approaches

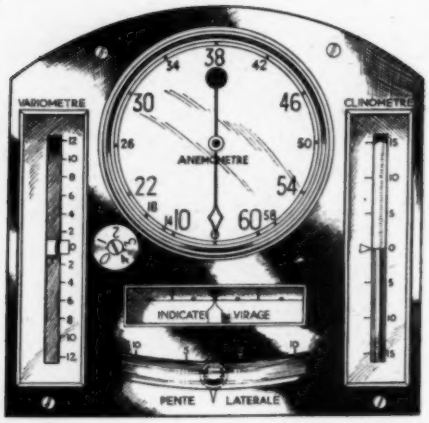
Now that the making of safe and accurate blind approaches is no longer a mere theoretical possibility it is a pity that Germany, in the shape of the Lorenz A.G., is not represented at the Show, and that neither Smith's nor Standard Radio exhibit any items of the equipment concerned. However, the Société Française Radio-electrique shows a "working model" of a directional beam track, accompanied by the appropriate "noises off" as the model leaves its correct course, and in the French Air Ministry section there is another model in which marker beacons produce the now familiar high-pitched note as the wire-borne model crosses them.



Instrumentality in excelsis: The Caudron Rafale trainer mentioned in this article. An example of the blind-flying panel will also be seen. (*Flight* photograph.)

A New Short-wave Set

The most interesting radio exhibit did not arrive until after the Show opened. This is the new lightweight two-way short-wave Standard set designed primarily for fighter use, but applicable also to private owners' machines—if and when ground stations are provided—since the weight, including the transformers, is less than 40 lb. For its control there are just two selection levers and a push-button change-over switch. In addition to the normal ground and air sets for medium waves, and a model of a Standard-Adcock D/F aerial system, there is the very latest version of direction finder for aircraft use. This, with its streamlined loop and directional dial, shows adequately what *can* be done in these days for machines flying as self-contained units.



A typical Aera blind-flying panel with the A.S.I. dominating the whole. The other instruments will be recognised as (left) a rate of climb indicator and (right) a liquid pitch indicator. Below is a turn indicator and a ball-type lateral level.

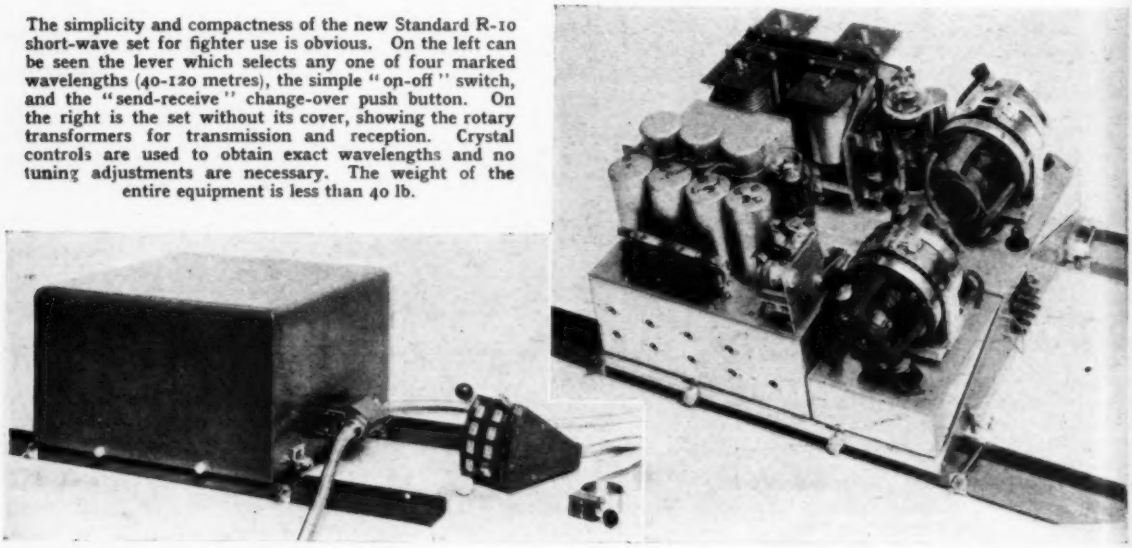
Apart from landing lights as accessories—and there is a particularly interesting example of "thin-wing stowage" Harley lamp on the Smith's stand—there is nothing very new in the matter of size or in the way of installation. The Letov S.528 has, in addition to a pair of searchlights on the port wing, a couple of downward-directed lamps, about four inches in diameter, flush in the fuselage. These, presumably, are intended to give the pilot a close-up view of the ground just as he holds off, so that he can open up again and wind his tail wheel rapidly if the surface is not quite what he expects it to be.

Presumably, military pilots do without such unnecessary luxuries as de-icers, and there are very few, if any, in the exhibition. In fact, the only complete installation was to be seen on the big Farman; Goodrich de-icers are here arranged on the leading edge, fins and tail-plane. On a machine of this size the additional weight of the equipment should not be very important. This Farman, too, has the most complete of navigational layouts in the Show, though the dashboard, separately exhibited on the stand, showed no signs of blind-approach instruments. Presumably the machines will eventually have such equipment, since both Le Bourget and Croydon, at least, have the necessary ground installations either in action or in abeyance. One visitor looked at the undercarriage indicator, consisting of two crossing needles, and thought aloud that Farmans were using an American blind-approach instrument; it is not unlike the visual course indicator developed in that country.

Incidentally, six Farmans have been ordered by Air France almost entirely on the strength of the opinions of South Atlantic pilots, who have been using a converted bomber of the same general design. Nobody can say now that transport pilots' opinions are *never* considered in the selection of a fleet!

The latest type of "flying" direction-finding unit produced by Standard Radio—the R-9. The bulbous affair is the streamlined casing for the rotating loop. Its small overall dimensions will be gathered from the size of the plug orifices and the tuning dial. (*Flight* photograph.)

The simplicity and compactness of the new Standard R-10 short-wave set for fighter use is obvious. On the left can be seen the lever which selects any one of four marked wavelengths (40-120 metres), the simple "on-off" switch, and the "send-receive" change-over push button. On the right is the set without its cover, showing the rotary transformers for transmission and reception. Crystal controls are used to obtain exact wavelengths and no tuning adjustments are necessary. The weight of the entire equipment is less than 40 lb.



THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

THE London-Isle of Man air race will be held next year on May 29.

A special Monospar S.T.25 has been ordered by the Turkish State Air League for parachute jumping.

A Russian A.N.T.-6 monoplane fitted with four AM-34 engines of 800 h.p. each has reached 29,460ft. carrying a five-ton load.

A machine is being constructed in Tokyo which, it is said, will be capable of flying non-stop from Tokyo to New York, a distance of 6,500 miles.

A Hawker Hart with cockpit enclosures and a Bristol Perseus sleeve-valve engine is being sent to Canada for test under low-temperature conditions.

With a Bristol Mercury VIII engine, the Hart does 209 m.p.h. at 15,550 ft. and climbs to 17,000 ft. in 7 min. 23 sec. Controlled cooling is embodied.

Two of the seven Blackburn Sharks recently purchased for the Royal Canadian Air Force have arrived at Rockcliffe Aerodrome, Ontario. These machines cost nearly £13,000 each.

M. Andre Japy, endeavouring to break the Paris-Tokyo record in a Caudron, crashed last Thursday on a foothill to the north-west of Kyushu Island, near his goal. He is expected to live.

Ten Curtiss Hawk single-seater fighter biplanes with Cyclone engines, retractable undercarriages and enclosed cockpits were presented by the residents of Shanghai to General Chiang Kai-Shek on his fiftieth birthday.

Twenty-five civil-rated Perseus engines have been ordered for installation in a number of the Short Empire flying boats. The Pegasus Xc is the unit specified in all machines built up to the present.

It is claimed that aircraft flying on Russian Arctic routes have carried 5,400 passengers and 900 tons of freight in a year; they flew a total of 12,900 hours and covered 1,666,600 miles.

There are about six hundred parachute jumping towers in the U.S.S.R., and last year 800,000 jumps were made from them.

The Rumanian Government has placed an order for a Monospar Ambulance. It will be stationed at Bucharest.

The Swedish aircraft-carrying cruiser *Gotland*, which was described in *Flight* of February 13, is visiting Southampton.

The week before Christmas a Douglas D.C.2 of K.L.M., piloted by Commander Duimelaar, will leave Paris for Abyssinia. It has been chartered by a French banker.

Herr Heini Hoffman, the German racing cyclist, claims to have flown 430 yards by his own "leg power." A prize is being offered by the Frankfurt Polytechnic Institute to the first inventor to fly a man-propelled machine for 500 yards.

The Fifth International Congress for Applied Mechanics—in which an aerodynamics section is included—will be held in Cambridge, Mass., U.S.A., next September. Details are obtainable from the Massachusetts Institute of Technology, Cambridge, Mass.

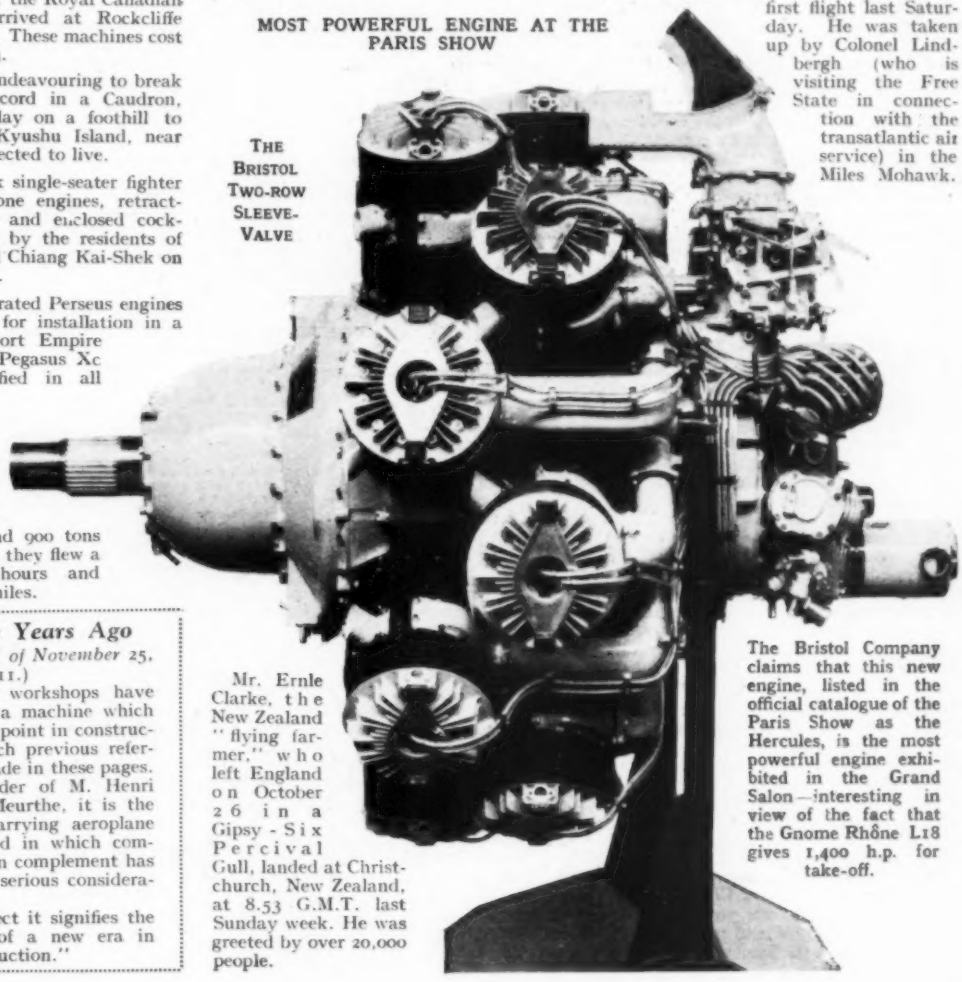
Pilots are requested to refrain from flying in the immediate neighbourhood of the spire of the parish church at Louth, Lincs. This is in a dangerous condition and, pending the completion of restorative work, vibration may seriously affect the structure.

In view of the above news, it is interesting that, according to Sir Philip Sassoon, research on exhaust silencers is virtually complete. A report will shortly be made public. Sir Philip cannot hold out any prospect of a substantial reduction in the noise attributable to the airscrew and airframe.

Mr. De Valera, President of the Irish Free State Executive Council, made his first flight last Saturday. He was taken up by Colonel Lindbergh (who is visiting the Free State in connection with the transatlantic air service) in the Miles Mohawk.

MOST POWERFUL ENGINE AT THE PARIS SHOW

THE BRISTOL TWO-ROW SLEEVE-VALVE



The Bristol Company claims that this new engine, listed in the official catalogue of the Paris Show as the Hercules, is the most powerful engine exhibited in the Grand Salon—interesting in view of the fact that the Gnome Rhône L18 gives 1,400 h.p. for take-off.

Mr. Ernle Clarke, the New Zealand "flying farmer," who left England on October 26 in a Gipsy-Six Percival Gull, landed at Christchurch, New Zealand, at 8.53 G.M.T. last Sunday week. He was greeted by over 20,000 people.

Twenty-five Years Ago

(From "Flight" of November 25, 1911.)

"The Blériot workshops have just turned out a machine which marks a distinct point in construction and to which previous reference has been made in these pages. Built to the order of M. Henri Deutsch de la Meurthe, it is the first passenger-carrying aeroplane to be constructed in which comfort of the human complement has been taken into serious consideration.

"In this respect it signifies the commencement of a new era in aeroplane construction."

HERE and THERE

News of the Latest Developments in the Industry and Elsewhere

Heston's Future

FOLLOWING the announcement in *Flight*, and in the leading dailies, that Heston was likely to lose some very valuable land, the London Chamber of Commerce sent a letter to Lord Swinton urging the prevention of the sale, and now it is learnt that the Air Ministry has, in fact, decided to buy the land concerned. Sir Philip Sassoon made this announcement in the House last week.

Jablo Airscrews Approved

IT is announced that the Royal Aircraft Establishment has approved the Jablo airscrew, and the makers are thus able to start production at their new factory at Ipswich.

It may be recalled that the Jablo airscrew process was described in *The Aircraft Engineer* supplement to *Flight* of October 29. The system is the well-known German Heine one, and Jablo Ltd., of Brettenham House, Lancaster Place, London, W.C.2, hold the rights for this country.

Air Mail Side Show

A NEW idea for popularising the use of air mail, and one particularly interesting to collectors of flown covers, is to be seen on the Air France stand at the Paris Aero Show, which is devoted to the dissemination of information about air mail facilities. Beside this stand the French Post Office authorities have set up a miniature branch office for posting air mail. It is equipped with a specially designed cancellation punch to be used on letters posted on the spot, and such letters may be of value in the future. A loud speaker periodically announces zero hour for clearances to different air mail destinations.

Major P. W. S. Bulman

ONE very well known in the world of aviation figures among the directors of a new company, the formation of which has just been announced. Major P. W. S. Bulman is named as a director of Aerolex Ltd., a private company registered on November 20 with a capital of £5,000 in £1 shares. The objects are stated as follows: "To carry on the business of aeronautical experts and consultants, manufacturers and repairers of and dealers in aeroplanes, etc."

The other directors are William S. Cave, Edwyn T. Close and Guy C. Vaughan-Morgan. The registered office is at 16, Victoria Street, London, S.W.1.

An Important West-country Development

AIRCRAFT INDUSTRIES CORPORATION, LTD., have purchased the controlling interest in the ordinary shares of Petters, Ltd., and five new directors have been elected to the board of that company.

Sir Ernest W. Petter continues as chairman of the company, and all other directors remain, with the exception of Mr. G. B. Petter, who desires to retire from business and has accordingly resigned.

Petters, Ltd., the well-known Yeovil manufacturers of oil engines, own 50 per cent. of the capital of Westland Aircraft, Ltd. The issued capital is £312,500, divided into 200,000 preference and 112,500 ordinary £1 shares.

Aircraft Industries Corporation was formed in October, 1935, as a finance company. It was associated with the issues of capital in Craven Brothers (Manchester), Ltd., and British Marine Aircraft, Ltd., made earlier this year.

Short Bros. Progress

AFTER payment of a dividend of 30 per cent., a balance of £79,295 remains to be carried forward; this news was announced by Mr. H. O. Short (chairman) at the annual general meeting of Short Bros. (Rochester and Bedford), Ltd., held in London last Friday. The profit on the year's trading was £74,325, which, with receipts from royalties, commissions, etc., made a total of £86,714.

Among the points referred to by Mr. Short were the new Belfast factory—in connection with which a contract had already been received from the Air Ministry; the introduction of the Empire Boats; and the valuable team work contributed by all branches of the company's organisation under heavy stress of work. He also paid a tribute to the General Manager, Mr. Arthur Gouge, and to one whose services they had secured during the past year, Sqn. Ldr. H. W. McKenna.

Mr. Short said that the country was now in a boom period as regards the production of military aircraft and they must not expect such active building to continue indefinitely. Indeed, they must hope that political conditions in Europe would improve and make it unnecessary, because if it led to war the present prosperity of this country would vanish.

The Youngman Dinghy

FOLLOWING a paragraph which appeared in a recent issue the R.F.D. Company, Ltd., of Stoke Road, Guildford, Surrey, point out that they are the sole makers of the Youngman dinghy, and hold the commercial rights.

Navigation Classes in Scotland

WHAT is the demand for navigational instruction in Scotland? A fully qualified instructor, who is contemplating the organisation of such classes for first- and second-class navigators' certificates, is anxious to sound readers' opinions on this question. Letters addressed "Navinstructor," c/o The Editor, will be forwarded.

A Thousand Hirths

A GREAT number of the current German light training and sporting aircraft mount the 80 h.p. Hirth HM 60R four-cylinder, air-cooled, inverted engine. One thousand of these units have been built, having been exported to several countries outside Germany.

The HM 60R is the design of Herr Helmuth Hirth, whose interest in aviation took root in England in 1908, when he was managing the Leicester branch of his father's machine factory.

The Coventry Aero Engines Issue

AS foreshadowed in *Flight* last week, Coventry Aero Engines and Components, Ltd., which has been formed to manufacture the Lorraine engine in this country, is about to make a public share issue.

The subscription list will open and close next Wednesday, December 2, and the prospectus and forms of application are obtainable from to-morrow. The issue is sponsored by the Commercial and General Finance Trust, Ltd., Kent House, Telegraph Street, London, E.C.2.

The Lowe-Wylde Fund

CONTRIBUTIONS to the Lowe-Wylde fund totalled £946 9s. on October 1, the latest list of donations being as follows:—

	£	s.	d.
W. and T. Avery, Ltd.	5	5	0
Reynolds Tube Co., Ltd.	5	5	0
T. E. Rose Richards	1	1	0
J. Wright	1	1	0
P. B. Swan	1	0	0
Saunders-Roe, Ltd. (Staff)	5	13	6
The General Fire Appliance Co., Ltd. ...	3	3	0
R. Luen, Esq.	2	2	0
H. C. Puttick	1	1	0

Further contributions to the fund (which is to provide for the children of the late Mr. C. H. Lowe-Wylde, the ultra-light-aircraft pioneer are still urgently required, and should be sent to Mr. E. C. Gordon-England at the London Air Park, Feltham, Middlesex.

Mr. Walter S. Field

FLIGHT regrets to announce the death through illness, recently, of Mr. Walter S. Field, who had been the hon. treasurer of the R.A.F. Hospital Fund until 1920, when it was closed, and who thenceforward devoted himself to the interests of the Royal Air Force Benevolent Fund. He served continuously as a member of the council and on all the committees. He became chairman of the grants committee in November, 1929, and chairman of the finance committee in May, 1932. He was elected deputy hon. treasurer in March, 1933, and became the hon. treasurer in succession to Sir Charles McLeod in July, 1934. He retained these offices until the time of his death.

Group Capt. Carmichael, secretary of the Fund, observes that Mr. Field never spared himself and gave wholehearted service to the Royal Air Force Benevolent Fund, and through it to the Royal Air Force both past and present.

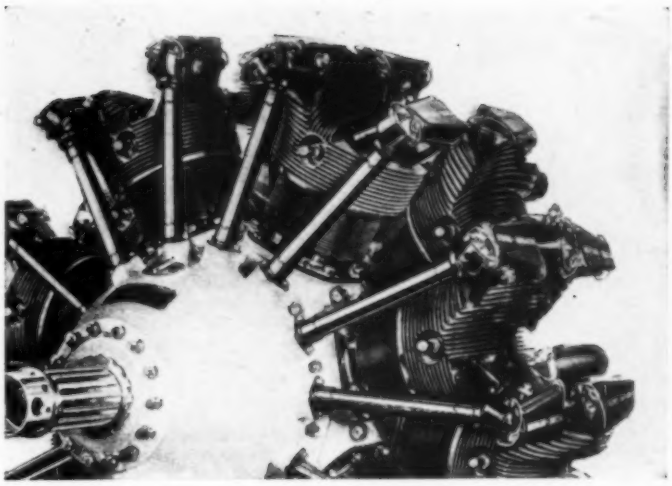
POWER at the SALON

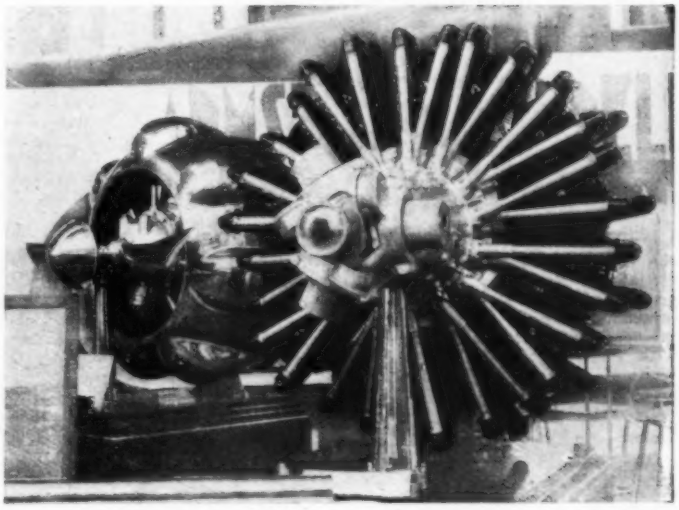
A Detailed Review of the British and Continental Engines at the Show : A Remarkable Variety of Types

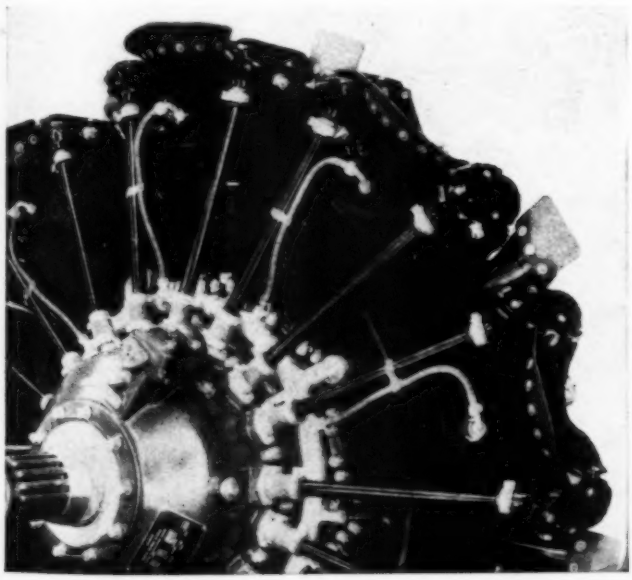
AS indicated in our brief review last week, the variety of engine types displayed at the Paris Salon, and their range of power, are greater than at any previous show. A notable feature is the fact that the majority of firms are interesting themselves in a wide variety of types rather than specialising in one particular arrangement of cylinders. It is unfortunate that more British engine and aircraft firms are unable to take part, and the absence of German and Italian manufacturers, who can usually be depended upon to introduce several departures, is noticeable; however, it would appear that the French firms are seeking to obviate any impression of this absence by their own multifarious displays.

It does not appear that any one engine class is in the majority, but it is apparent that an advance has been, and is being, made with high-powered radial engines. Gnome Rhône have added to their range a two-row 18-cylinder radial, known as the 18.L., which gives 1,400 h.p. for take-off and 1,300 h.p. at 11,000ft. at 2,150 r.p.m.; the diameter is 4.59ft., and the weight 1,587 lb.

Fourteen-cylinder two-row radials are exhibited by Armstrong Siddeley, Gnome Rhône, Hispano-Suiza, and Renault. The first-named show a V.P. Tiger IX giving a maximum output of 805 h.p. and rated output of 795 h.p. at 0,250ft.; this engine will power the A. W. Whitley bomber and Imperial Airways A.W.27. Gnome Rhône have the well-known K.14 Mistral Major with 1,100 h.p. take-off power and a rating

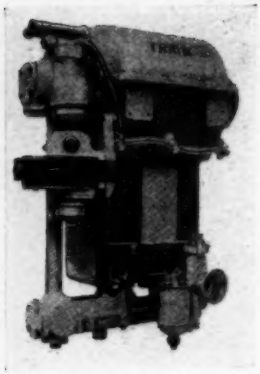




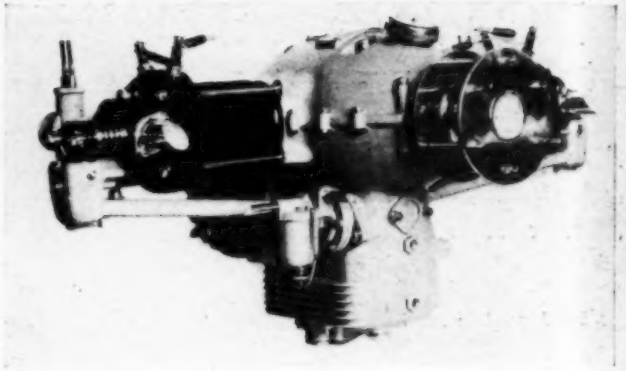


(Top) The small diameter of the fourteen-cylinder Type 80 Hispano-Suiza is apparent.
(Centre) The Cheetah IX, complete with cowling, and the Tiger IX with V.P. equipment, make a handsome display.
(Left) No less than 2,800 sq. in. of cooling area is credited to the Wright Cyclone G. Note also the neat total screening and valve mechanism enclosure.

of 1,000 h.p. at 11,000ft. Eight countries hold the licence to build these engines. The firm also show, for the first time, the M.14, a very compact two-row engine of 38in. diameter rated at 650 h.p. at 13,000ft. and giving 700 h.p. for take-off; the weight is only 826 lb. They have recently developed controlled cooling for their engines. Hispano-Suiza have two fourteen-cylinder radial types. There is the 14AA-06 (type 79), rated at 1,100 h.p. at 9,840ft. and 2,125 r.p.m., moderately supercharged forms being available, and also alternative gear ratios. This engine is installed in the Loire 250 single-seater fighter. Secondly, we find the 14AB-00 and -02 (type 80) (8·5 reduction or direct drive), an engine comparable with the Gnome Rhône M.14, giving 680 h.p. at 11,480ft. The weight and diameter are respectively 1,014 lb. and 39.5in. Both the Fokker and Potez twin-engine machines are powered with this unit. The fourteen-cylinder Renault of 46 litres capacity is a comparative newcomer with a rated output of 1,000 h.p. and normal ground-level output of 860 h.p.



One of the smallest engines exhibited, the Train 2T., has an underhead camshaft.



The Walter Atom of 1,100 c.c. capacity has a finned oil compartment below the crankcase; 28 h.p. is the maximum output.

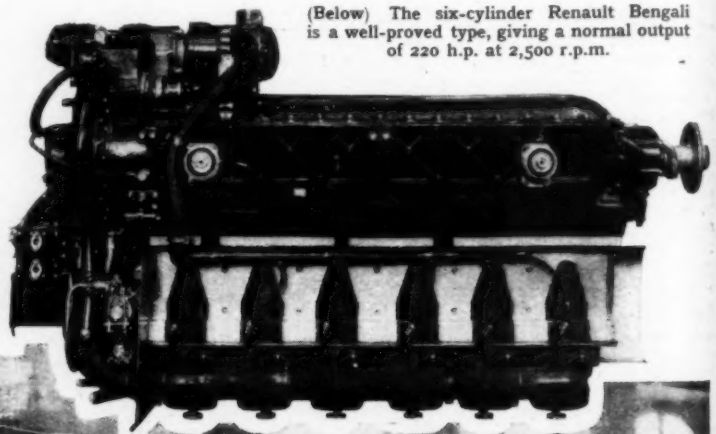
Nine-cylinder radial engines appear the most numerous; eight of the total of seventeen manufacturers show examples, and of these Walter have a range of eight engines from the 150/165 Gemma I to the 400/450 Super Castor II. Most points of design are standardised in these engines. A reduction gear *à satellites* of 3:2 ratio is fitted to the Bora II-R, Super Castor I and II and Pollux II, Castor and Pollux having strengthening ribs from crank case to reduction gear face. With the exception of the Gemma, all the engines have two totally enclosed push-rods per cylinder and two separate rocker boxes.

The Bristol stand is at all times crowded. The Pegasus X, with a maximum output of 915 h.p., and the 840 h.p. Mercury VIII, are two of the most powerful engines at the show. The sleeve-valve Perseus, one of four which Imperial Airways have been testing in *Syrinx*, is creating great interest. Added to these is an extraordinarily interesting last-minute arrival, of which more anon.

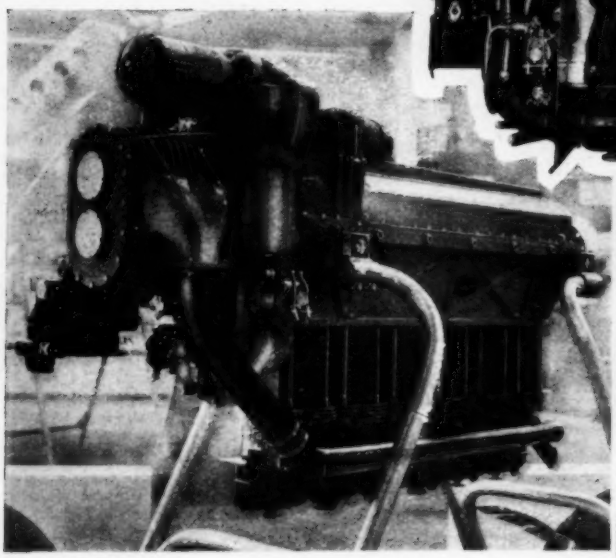
On the Curtiss-Wright stand may be seen the latest Cyclone G, which gives 1,000 h.p. for take-off, and the re-rated Whirlwind F. of 400/480 h.p., which has the new super-finned heads and Wright dynamic damper. Both engines have automatic rocker lubrication with improved oil sealing and very neat ignition screening. Uniform cooling of cylinder barrels and heads is claimed, by reason of the use of full pressure inter-cylinder baffles. The Cyclone G is to power the new Douglas and Boeing bombers in America, while among manufacturers of civil types the Whirlwind is installed in certain Waco, Stinson and Fairchild products, and also in Howard and Beechcraft models.

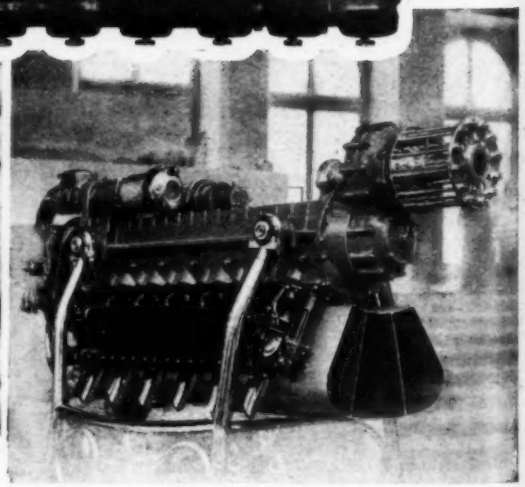
Nine-cylinder radials of under 100 h.p. are rare, but the Salmson range of radials starts with the improved 9 ADR of only 60 h.p. Many small aircraft, including the two-seater cabin *Pou*, and the Bassou pusher of the type recently brought to England by Col. Fitzmaurice are equipped with this little unit. The largest Salmson is the 9 AG-01 with an output of 350/390 h.p. The 9 ABA, of 280 h.p. rating, powers the Romano 80 trainer. The 9 NAS, NO and ABA have a neat front exhaust collector ring, together with hot-spot intake. Many aircraft, including Lioré et Olivier, Mureaux,

(Below) The six-cylinder Renault Bengali is a well-proved type, giving a normal output of 220 h.p. at 2,500 r.p.m.

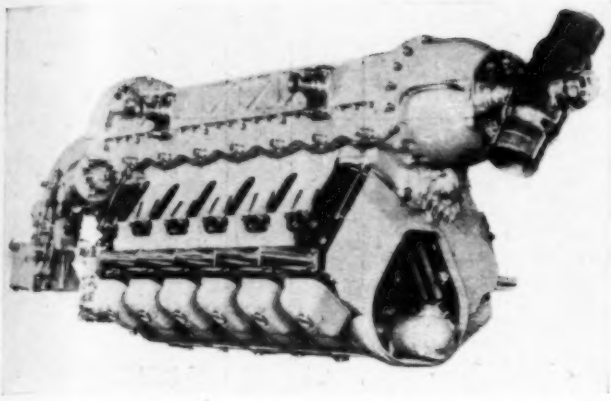


(Below) An interesting Regnier engine with Roots blower.





(Right) A *canon* airscrew boss and an unusual air scoop are the special points of the Salmson inverted vee twelve.



The off-set induction pipe on the Walter Sagitta I and II gives the impression of a wide angle between banks. It is, however, 60 deg., as in most vee-type engines.

Bloch and Morane, are now equipped with these engines.

Renault produce a larger engine giving 680 h.p., while Lorraine are represented in this nine-cylinder category by the 9Ab of 180/230 h.p. and the Algol Major, which is rated at 420 h.p., both being unsupercharged types.

The latest form of Armstrong-Siddeley Cheetah IX engine gives 310 h.p. rated output and 350 h.p. maximum. It is fitted for a Ratier constant-speed airscrew, although, as for the Airspeed Trainer, a D.H. variable-pitch airscrew can be used.

Well established in the same class, the Gnome Rhône Titan Major is rated at 12,100ft. to give 360 h.p., while the Lorraine Mizar Major of 16.163 litres capacity has an output of 300 h.p. at sea level. Of the smaller radial sevens, Farman 7EAr, 7EArs and 7ED are of 150, 170 and 170 h.p. respectively; the EAr is rated at sea level and the supercharged EArs at 4,000ft., while the ED is the direct-drive version of the EAr. A single radial seven appears in the Walter list of sixteen models—the 17-litre Castor II rated at 275 h.p. and giving 300 h.p. at 3,280ft. and 2,000 r.p.m.

Several neat lightweight power units are displayed at the Show, arrangement varying from a radial three of 3¼ litres capacity giving 60-70 h.p., produced by Lorraine under Potez licence, to an inverted in-line twin, four and six shown by Train. These last named engines, known as the 2T, 4T and 6T, have their parts standardised, the rated powers being 20-25, 40-50 and 60-70 h.p. The valves are operated by underhead camshafts with rear drive and the aluminium-bronze heads are detachable. The 60-70 h.p. 6T powers the S.F.A.N. 5.

Regnier offer a horizontally opposed, air-cooled twin giving 62 h.p. at 2,500 r.p.m. Valves and push-rods are uncovered and the whole design appears very simple. This firm also manufactures two small inverted in-line fours of 50 and 85 h.p.

Two-strokes

A.V.A. show in the latest forms their air-cooled flat four two-strokes of 25-30 and 35-40 h.p.; the engines differ only in the bore being increased by 10 mm. to 80 mm. in the larger one. The Farman Moustique is powered with an Ava engine or Mengin flat twin, and examples of both are displayed.

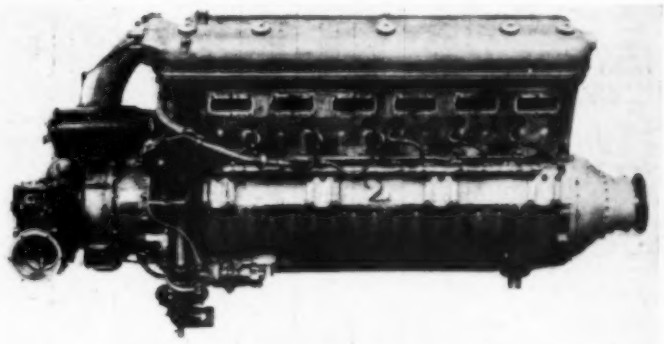
The Czechoslovakian Walter Atom 1.1 litre flat twin has a finned oil compartment under the crankcase, and also two carburetters and dual ignition; the output is 28 h.p. maximum at 3,000 r.p.m. On the same stand are the Mikron and Minor inverted fours; two of the latter engines, as a pusher installation of 85-95 h.p. each, drive the Praga E.210. The Mikron of 2.18 litres capacity has a maximum output at 2,800 r.p.m. of 55 h.p.

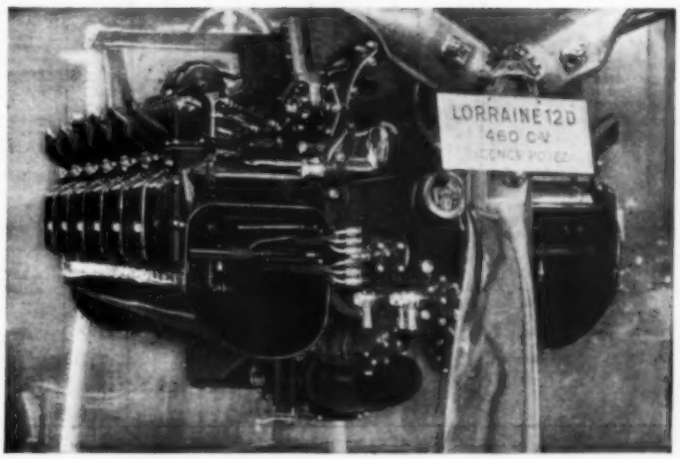
Perhaps the most interesting six-cylinder engines are made by Renault. In supercharged or normally aspirated form, the Bengali 6Q-00 and 6Q-04 give 220 h.p. at sea level and 13,100ft. respectively; the four-cylinder Bengali P.ei. and Junior are of 140-150 and 100-103 h.p. rating. Specially modified for the Coupe Deutsch race, the Renault 8-litre six-cylinder Coupe Deutsch engine has a normal output of 360 h.p. The cylinder heads are heavily finned. One Stromberg carburetter feeds a very neat blower situated behind the crankcase, but the Bengali range are fitted with Zenith carburetters.

On the Regnier stand may be seen the 180 h.p. R.6, together with several four in-line types closely resembling D.H. Gipsy Major; the R.6c is a new departure, with a rated altitude of 13,100ft. when the output is 250-310 h.p. at 2,600 r.p.m.; the Roots Blower turns at four times engine speed. The engine is the production form of the Coupe Deutsch unit and has a redesigned distributor and Zenith carburetter for inverted flying. The generator is neatly mounted between the magnetos. Separate aluminium bronze heads with finned exhaust ports are standard and a gas starter is fitted. The six-cylinder 7,971 c.c. Salmson is rated at 280 h.p.

The compact four-cylinder 82-90 h.p. Cirrus Minor and 135-148 h.p. Major Mark II represent this country in the light engine department.

Many manufacturers this year show newly developed inverted vee-type engines; the Salmson is a well arranged example, the twin underhead camshafts on each row having front inclined drives. The cylinder heads, which are cast in pairs, carry half the camshaft casing, while the exhaust ports are central in each head. The auxiliary drives are arranged for simplicity, the twin magnetos, mounted on top, using the same drive as the similarly mounted generator and compressor which they face. The 23:40 reduction gear is up-turned and the propeller boss is designed to take a *canon*. Long outside





(Upper right) An addition to the Lorraine series, the Sterna gives 810 h.p. at 2,575 r.p.m. (Right) It is not surprising, in view of its lay-out, that this twelve-cylinder Lorraine is unique at the show. The supercharger is just visible, placed horizontally underneath.

ENGINES at the PARIS SHOW

Maker, Type, and Nationality.	No. and Arrangement of Cyls.	Cooling.	Bore.	Stroke.	Compression Ratio.	Reduction Gear Ratio.	Normal Crankshaft R.P.M.	Rated Altitude.	Normal Altitude. Output	Max. Output.	Dry Weight.	Remarks.
	—		m.m.	m.m.				ft.	H.P.	H.P.	lb.	
AILE-VOLANTE : (France)												
C.C.4	4 H.O.	A.	100	95	6.5	D.	—	S.L.	—	65	143.3	—
ARMSTRONG SIDDELEY : (England)												
Cheetah IX	7 R.	A.	133.3	139.7	6.35	D.	2,100	6,000	310	350	635	Mod. supercharged. Max. power at 7,300ft. for IX and 7,800ft. IX (V.P.).
Cheetah IX (V.P.)	7 R.	A.	133.3	139.7	6.35	D.	2,100	6,750	335	345	635	
Tiger IX (V.P.)	14 R.	A.	139.7	152.4	5.35	0.594	2,375	6,250	795	805	1,248	Mod. supercharged. Max. power at 7,200ft.
AVA : (France)												
4A-00	4 H.O.	A.	70	70	5.2	—	2,300	S.L.	25	30	81.5	Two-stroke engines.
4A-02	4 H.O.	A.	80	70	5.2	—	2,500	S.L.	35	40	85	
BRISTOL : (England)												
Mercury VIII	9 R.	A.	146	165	—	0.572	2,400	13,000	795/825	840	980	Max. power at 14,000ft.
Pegasus XC	9 R.	A.	146	190.5	—	0.50	2,250	4,500	785/815	830	1,015	Mod. supercharged.
Pegasus X	9 R.	A.	146	190.5	—	0.50	2,250	4,000	810/850	915	1,005	Mod. supercharged.
Civil-rated Aquila	9 R.	A.	—	—	—	—	2,250	S.L.	420	500	795	—
Civil-rated Perseus II	9 R.	A.	—	—	—	—	2,200	S.L.	649/665	740/770	1,026	—
Perseus VIII	9 R.	A.	—	—	—	—	2,200	5,000	670	810	1,040	Max. power at 5,250ft.
CIRRUS-HERMES : (England)												
Minor	4 I.L.	A.	95	127	5.8	D.	2,300	S.L.	82	90	195	—
Major Mk. II	4 I.L.	A.	—	—	—	D.	2,000	S.L.	135	148	—	—
COATALEN : (France)												
12 Vrs 2	12 V.	W.	150	170	—	0.66	2,000	10,000	550	—	1,212.5	C.I. engine.
CURTISS-WRIGHT : (U.S.A.)												
Whirlwind F	9 R.	A.	127	139.7	6.9	D.	—	4,500	400	480	735	480 h.p. for take-off at 2,400 r.p.m.
Cyclone G	9 R.	A.	—	—	6.4	0.625	2,100	—	—	1,000	—	1,000 h.p. for take-off.
FARMAN : (France)												
7.EAr	7 R.	A.	115	135	5.2	0.50	2,150	S.L.	150	190	502.6	—
7.EArs	7 R.	A.	115	135	5.2	0.50	2,150	3,940	170	—	—	—
7.ED	7 R.	A.	115	135	5.2	D.	2,150	S.L.	170	190	392	—
9.EBr	9 R.	A.	115	135	5.2	0.50	2,150	S.L.	220	265	540	—
12.C.R.S.	12 I.V.	W.	100	120	6.5	0.50	3,400	19,685	400	460	650	Farman 2-stage blower.
GNOME RHÔNE : (France)												
Titan-Major 7K	7 R.	A.	146	165	—	D.	2,000	12,100	360	370	638	Mod. supercharged versions available. Also with 5 : 7 and 2 : 3 reduction.
Mistral 9K	9 R.	A.	146	165	—	0.50	2,450	13,280	600	620	869	
Mistral-Major 14N	14 R.	A.	146	165	—	0.50	2,360	11,000	1,000	1,100	1,234.5	
M.14	14 R.	A.	116	122	6.5	—	3,000	13,100	650	700	826	—
18.L00	18 R.	A.	146	180	5.5	0.684	2,170	11,000	1,300	1,400	1,587	—
HISPANO SUIZA : (France)												
12 Xirs	12 V.	W.	130	170	5.8	0.66	2,600	7,210	720	748	849	Also supercharged for 12,800ft.
12 Y.21	12 V.	W.	150	170	7	0.66	2,400	11,810	910	—	1,036	—
12 Y drs.	12 V.	W.	150	170	5.8	0.66	2,400	3,000	930	980	1,036	Also supercharged for 11,000 ft.
14 AB-00 (Type 80) ...	14 R.	A.	135	130	6.2	D.	2,500	11,480	670	—	1,014	Also with 5 : 8 reduction.
14 AA-06 (Type 79) ...	14 R.	A.	155.6	170	6.2	D.	2,125	9,840	980	1,100	1,311	Normal output at sea-level.
14 AA-00 (Type 79) ...	14 R.	A.	155.6	170	6.2	D.	2,100	5,080	940	1,000	1,289	0.624 reduction available.
LILLOISE : (France)												
Lille 6.BRS	6 L.	W.	105	2x160	—	—	2,100	S.L.	540	600	1,146	Two-stroke C.I. engine.
LORRAINE : (France)												
3 B	3 R.	A.	105	125	5.5	D.	2,200	S.L.	60	70	—	—
6 Ba	6 R.	A.	105	125	5.5	D.	2,200	S.L.	130	151	274	Two-row radial.
9 Ab	9 R.	A.	105	125	6	D.	2,100	S.L.	185	230	435	—
12 D	12 H.O.	A.	125	120	6.5	—	2,500	9,840	475	—	727.5	—
Mizar Major	7 R.	A.	140	150	5.6	D.	2,100	S.L.	300	330	588	—
Algol Major 9 N.02	9 R.	A.	140	150	5.6	D.	2,100	S.L.	420	450	740	—
Petrel 12.HFRS	12 V.	W.	145	145	6	0.647	2,650	13,100	720	—	1,069	—
Sterna 12.R.00	12 V.	W.	148	148	6	0.647	2,575	13,100	810	—	1,106	—
Eider 12.Q.00...	12 V.	W.	170	170	6	0.647	2,350	13,100	1,000	1,200	1,433	—
REGNIER : (France)												
R.2	H.O.	A.	114	118	6.2	D.	2,400	S.L.	57	62	145.5	—
R.4J	4 I.L.	A.	90	110	6	D.	2,300	3,750	60	68	165.3	—
R.4L-02	4 I.L.	A.	105	115	6	D.	2,300	S.L.	85	90	209.4	—
R.4	4 I.L.	A.	118	140	5.25	D.	2,300	S.L.	140	—	302	—
R.6	6 I.L.	A.	114	130	6.2	D.	2,300	S.L.	180	—	461	—
R.6c	6 I.L.	A.	114	130	7	D.	2,600	13,100	250	310	516	—
RENAULT : (France)												
Bengali Junior	4 I.L.	A.	120	140	5.3	D.	1,800	S.L.	100	103	320	—
Bengali P.ei	4 I.L.	A.	120	140	5.75	D.	2,400	S.L.	140	150	320	—
Bengali 6Q.00	6 I.L.	A.	120	140	6.4	D.	2,500	S.L.	220	—	485	With L. or R. rotation also supercharged for 6,560ft.
Bengali 6Q.04	6 I.L.	A.	120	140	6.4	D.	2,500	13,100	220	—	518	
Coupe Deutsch	6 I.L.	A.	109.75	140	—	—	3,200	—	360	—	—	—
19 litre 12.V	12 I.V.	A.	120	140	6.4	0.66	2,500	11,950	450	690	833	Max. power figures using over-ride.
Coupe Deutsch 12.V ...	12 I.V.	A.	90.7	90	—	—	—	—	500	—	699	
12.V.S.	12 I.V.	A.	115	115	—	—	—	13,100	450	—	801	
29.6 litre	9 R.	A.	154	176	6.4	—	2,100	—	680	890	—	
46 litre	14 R.	A.	154	176	6.4	0.67	2,000	—	1,000	—	1,422	
SALMSON : (France)												
9.ADR	9 R.	A.	70	86	5.6	0.5189	2,700	S.L.	60	70	170	—
9.ND	9 R.	A.	100	140	5.4	D.	2,050	S.L.	175	195	328	—
9.ABA	9 R.	A.	125	170	5.4	D.	2,000	S.L.	280	320	589	—
9.AG-01	9 R.	A.	140	160	5.1	D.	1,850	S.L.	350	390	620	—
6.TES	6 I.L.	A.	115	128	5.5	D.	2,500	—	250	—	456	—
12.VARS	12 I.V.	A.	110	120	6	0.575	3,800	—	450	—	794	Max. power using over-ride.
SH.18	9 R.	A.	118	2x150	16	D.	1,600	—	600	—	1,250	2-stroke C.I. Szydlowski licence.
TRAIN : (France)												
2 T	2 I.L.	A.	80	100	6	D.	2,300	S.L.	20	22	68.3	—
4 T	4 I.L.	A.	80	100	6	D.	2,300	S.L.	40	44	101 4	—
6 T.	6 I.L.	A.	80	100	6	D.	2,300	S.L.	60	66	139	—

D. = Direct Drive. R. = Radial. I. = Inverted. H.O. = Horizontally opposed. V. = "V" Formation. L. = In Line. S.L. = Sea Level. A. = Air. W. = Water.

Maker, Type, and Nationality.	No. and Arrangement of Cyls.	Cooling.	Bore.	Stroke.	Compression Ratio.	Reduction Gear Ratio.	Normal Crankshaft R.P.M.	Rated Altitude.	Normal Altitude Output.	Max. Output.	Dry Weight.	Remarks.
			m.m.	m.m.				ft.	H.P.	H.P.	lb.	
WALTER: (Czechslovakia)												
Atom	2 H.O.	A.	85	96	5.2	D.	2,600	S.L.	25	28	88.2	—
Mikron...	4 I.L.	A.	85	96	5.2	D.	2,550	S.L.	50	55	123.5	—
Minor 4	4 I.L.	A.	105	115	5.3	D.	2,260	S.L.	85	95	205	—
Major 4	4 I.L.	A.	118	140	5.2	D.	2,100	S.L.	120	130	309	—
Major 6	6 I.L.	A.	118	140	5.2	D.	2,100	S.L.	190	205	386	—
Gemma I	9 R.	A.	105	120	5.3	D.	1,850	S.L.	150	165	159	—
Scolar	9 R.	A.	105	100	5.4	D.	2,200	S.L.	160	180	342	—
Bora II	9 R.	A.	105	120	6.3	D.	2,200	S.L.	210	225	364	—
Bora II-R	9 R.	A.	105	120	6.3	0.666	2,400	S.L.	230	245	379	—
Castor II	7 R.	A.	135	170	6	D.	1,800	3,280	275	340	613	—
Pollux II	9 R.	A.	135	170	6	D.	1,800	S.L.	340	450	712	—
Pollux II-R	9 R.	A.	135	170	6	0.666	2,070	4,600	382	480	751	—
Super Castor I	9 R.	A.	135	146	5.5	0.666	2,200	5,900	410	450	783	—
Super Castor II	9 R.	A.	135	146	5.5	0.666	2,200	11,480	400	450	783	—
Sagitta I	12 I.V.	A.	118	140	5.5	{ 0.666 }	2,400	61,560	430	450	816	—
Sagitta II	12 I.V.	A.	118	140	5.5	{ 0.67 }	2,400	12,100	460	470	816	—

R. = Direct Drive. R. = Radial. I. = Inverted. H.O. = Horizontally opposed. V. = "V" Formation. L. = In Line. S.L. = Sea Level. A. = Air. W. = Water

induction pipes and a complete ignition screening system are included. This engine is the power unit for the Mureaux single-seater fighter and an alternative for the twin-engined Hanriot. Other new examples are the Walter 60° inverted V-12 Sagitta I and II. The frontal area is very small although an upturned spur reduction gear with *canon* boss of 3:2 or 0.67 ratio is fitted. The between-bank induction pipe is off-set to port. Each cylinder has a separate rocker cover and the head and barrel are held up by four stout studs to the crankcase, which has "waffle" sides. Two Lodge plugs are fitted in the outer side of each cylinder. For the Sagitta I maximum altitude power is 450 at 6,560ft. and 2,600 r.p.m. For the Sagitta II it is 470 h.p. at 12,140ft. and 2,600 r.p.m.

Best known of the inverted vee-twelve type is the Renault range. The Coupe Deutsch 8-litre racing engine has outside push-rods operated from camshafts in casings cast in with the crankcase side. "One-piece" cylinders are each retained by ten nuts at the base and the ultra-light rocker covers, one per cylinder, bed on a flange cast on the heads. One large-diameter central trunk pipe feeds the cylinders. The 19-litre vee-twelve gives 450 h.p. at 11,975ft., and its arrangement is rather different, since it has outside induction pipes from a T joint at the supercharger, and inside push-rods, while the heads are detachable. The V.12S, giving 450 h.p. at 13,100ft. resembles the Coupe Deutsch engine in arrangement; the reduction gear casing is ribbed and shaped on to the crankcase.

A Two-stage Blower

On the Farman stand, chiefly interesting for the two-stage blower, the type 12C.R.S. is shown with carburetter between blower and induction pipe. The firm specialise in the manufacture of many sizes of reduction gear.

Hispano-Suiza are not able to exhibit their *canon* engine, but examples of the latest 12 Xirs and 12 Ydrs fully and moderately supercharged engines, and also the 12 Y21, are to be seen. The 12Y series all have 3:2 reduction gears and the 12X series, 0.665, in compact casings split down the airscrew boss, the main lower portion being cast with the crankcase top half. Two outside trunk pipes each feed three induction manifolds which in turn supply two cylinders. The overhead camshafts have rear inclined drives.

For some years Lorraine have made large V-12 liquid-cooled engines. The Eider 12 Q-00, largest of the three models, is rated at 1,000-1,200 h.p. at 13,120ft. In general it follows Rolls-Royce practice, although the 11:17 reduction gear is of the planet, as opposed to the spur, type. Externally this unit is of clean appearance. The central trunk pipe branches out into Y shape and each cylinder is fed through cast aluminium manifolds. The Sterna 12R.00 is a new engine of 810 h.p. rating at 11,120ft. and 2,575 r.p.m. Its capacity is 30,500 c.c. and that of the Eider 46,300 c.c. Two Bronzavia carburetters feed separately to the supercharger, one above the other, and complete flexible ignition screening is supplied. The Petrel, of 28.7 litres capacity, has an output of 720 h.p. at 13,120ft. and 2,650 r.p.m.

Under Potez licence, Lorraine build a 12-cylinder horizontally opposed air-cooled engine with an output of 475 h.p. at 2,500 r.p.m. at 9,840ft. Each cylinder is separate and has two pushrods on the underside. The exhaust ports are square and finned. The centrifugal supercharger is situated horizontally underneath and the carburetter is in front with forward-facing air intake. At the back a "T" joint branches out to the two induction pipes which have an inter-expansion chamber.

A single new water-cooled 60-deg. V-12 engine is displayed on the U.R.S.S. stand, the type number being AM-34 F.R.N.A., but no figures are yet disclosed. The design is clean and again the layout follows normal practice for this type. The output is probably about 1,200 h.p.

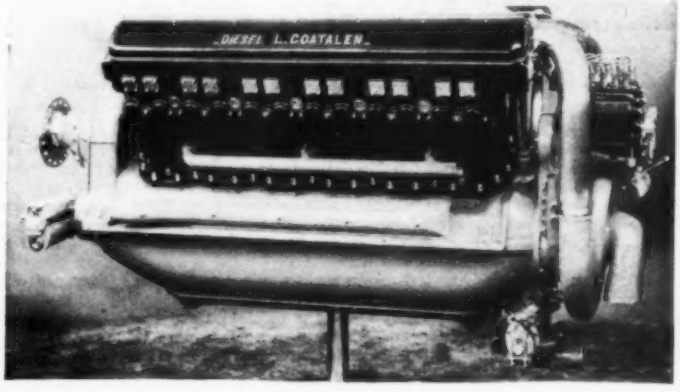
A new arrival at Paris is the Coatalen, a name well-known in connection with Sunbeam cars. The engine is a 60-deg. Vee-twelve compression-ignition engine with comparatively sleek lines and small frontal area. Normal output is stated as 550 h.p. at 1,350 r.p.m. and the minimum speed of the airscrew through the 3:2 spur-type reduction gear is 150 r.p.m. Constant pressure injection (700 kg./cm² = 9,956 lb. sq. in.) is effected by a Coatalen pump. A centrifugal compressor retains atmospheric pressure at 9,800ft. The cylinders, in banks of six, have four-valve heads.

Compagnie Lilloise have a modified two-stroke C.I. engine, the Lille 6BRS, built under Junkers licence, for which 540-600 h.p. is claimed; the capacity is 16.62 litres.

The unusual Salmson 9-cylinder water-cooled radial oil engine built under Szydlowski licence which, however, is by no means a newcomer, is apparently unchanged this year. At 1,600 r.p.m. the rating is 600 h.p. Each of the nine double cylinders has two barrels and two pistons in two-row arrangements with a common combustion chamber and direct injection. On the French Air Ministry stand can be seen the Clerget 14-cylinder radial C.I. engine, but this again appears to be little changed.

The inter-stand whisperings of a new Bristol engine, after the name Hercules had appeared in the catalogue, were substantiated last Thursday by the arrival at Paris of a fourteen-cylinder, two-row, radial sleeve-valve engine.

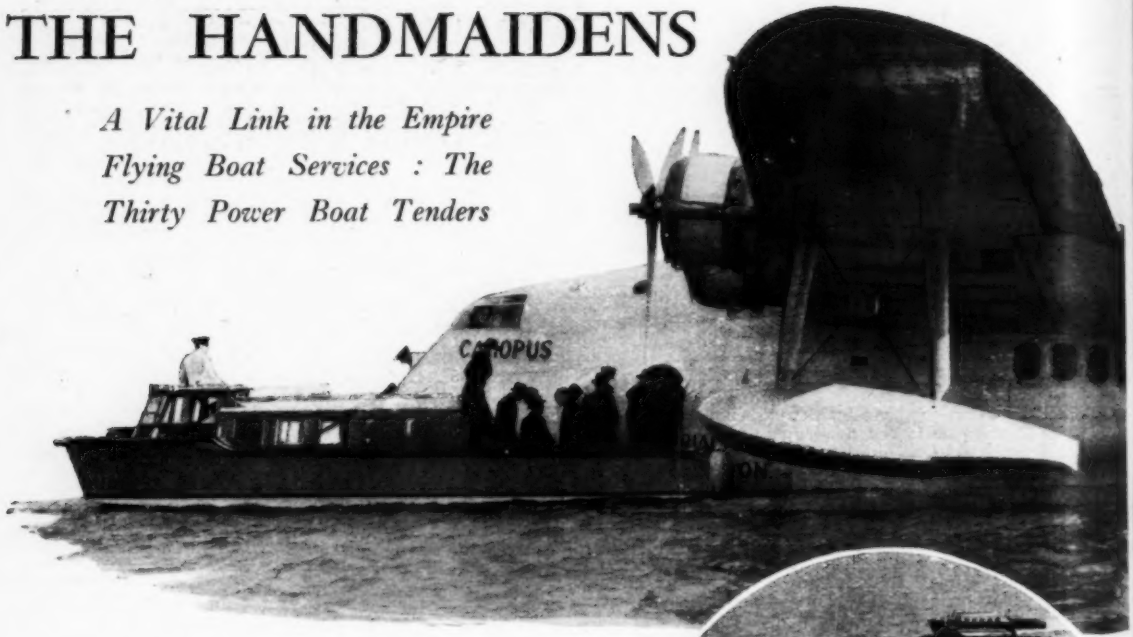
The cylinders of this unit are of similar size and design to those of the Perseus. No figures have been announced but the power is said to be undoubtedly in excess of any other engine at the show, so that more than 1,400 h.p. will be expected for take-off; this figure represents the take-off power of the 18-cylinder, radial Gnome Rhône 18L.



Compression-ignition engines are few this year, but this new Coatalen of 550 h.p. is causing considerable interest.

THE HANDMAIDENS

A Vital Link in the Empire Flying Boat Services : The Thirty Power Boat Tenders



"Flight" photograph.

AS related in *Flight* a fortnight ago, a batch of thirty launches is being built by The British Power Boat Co., of Hythe, Southampton, to service Imperial Airways' new flying-boat routes.

A section of the fleet was demonstrated in Southampton Water last week, and a really impressive spectacle the demonstration made, for the boats are capable of 28 m.p.h. and have remarkable manœuvring powers—an important consideration in view of the work which they are to undertake.

Measuring 36ft. 6in. overall, 8ft. 6in. in beam and with a draught (at rest) of 2ft. 9in., the boats have a special system of cross-braced construction which should make for unusual strength and seaworthiness.

As regards controllability it is stated that the craft can turn on the rudder at right angles at full speed in under five seconds, while, utilising the twin screws, they can turn round in their own length, as though on a pivot. Acceleration is such that 28 m.p.h. may be attained from a standstill in under eight seconds.

Collection of mails from flying boats will be one of the duties of the tenders, so it is interesting to note that they can carry a distributed load of two tons. As regards passenger accommodation, comfortably upholstered seating is provided along both sides of the main cabin for twenty passengers, life-saving equipment being stowed under the seats. Thanks to the general ease of handling, each boat requires a crew of only two men.

In addition to mail and passenger-carrying work, the duties of the boats will include the assisting of flying boats to alight by means of searchlights and flare-laying, towing of aircraft, and the transport of maintenance personnel.

Power is provided by two 200 h.p. Meadows engines, of which ease of starting from cold is an outstanding quality.

Equipment includes a separate generating plant to provide current for the searchlight and other electrical items.

WINGED AND FINNED

JUST on a year ago *Flight* published the first account of how Air Service Training, Ltd., was setting about preparing Imperial Airways pilots for their part in the revised programme of operations. It is generally realised by now that this programme is based on the use of twenty-eight Short Empire flying boats, the handling of which demands very specialised knowledge. In effect, their pilots-to-be are having to "go back to school," although nearly every one has over a thousand hours' landplane flying to his credit.

Last November A.S.T. undertook to train a minimum of one hundred Captains and First Officers, and up to the present forty-seven have satisfactorily completed the special course prepared for them. Three or four pilots at a time report to Hamble and in four-and-a-half weeks become conversant with such nautical practice as will benefit them when they man the big "C" class boats on the Empire and Atlantic services.

At Hamble last week visitors were privileged to see something of the work involved. The complete course takes a hundred hours, being made up of 32 hours dual and solo flying in Cutty Sarks and a Calcutta, fifteen hours of lectures, thirty-six of seamanship and seventeen of signalling and miscellaneous subjects.

The curriculum includes instruction in leaving and approaching moorings; manœuvring on the water under various conditions of wind and tide; the use of drogues; anchoring; coming up a slipway; taxying with one, two or three engines with the use of drogues; and alighting and taking off under conditions of glassy sea, swell, or rough sea.

Visits by pupils to the Supermarine and Saunders-Roe works are arranged when practicable.

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AN ENGINEER at the PARIS SHOW

Some Impressions of the Progress Made : Flush Riveting : Getting Rid of "Buckles"

By H. J. POLLARD, Wh.Ex., F.R.Ae.S.

THE task of suitably reviewing and assessing the values of different ideas shown at comprehensive aircraft exhibitions is becoming more and more difficult—another instance of the paradox that the simpler a thing looks the more complicated it may be. At one time, for instance, a survey of different types of wing bracing afforded much useful matter for comment and comparison. Now, however, in the main, all one sees is an almost deadly uniformity of unbraced monoplane wings, and the essential points of such structures are in general completely hidden from view.

It is disappointing, therefore, not to be able in the following (which is intended to be a review of such points of primary interest as were discernible) to devote considerable space to a description of those structural matters which have proved troublesome of solution in the development of monoplane airframes. We are, however, saved from one danger by this lack of observable detail, since if the designer has been presented with some very awkward problems to keep pace with progress, the critic—though without the responsibility of the designer—generally has his personal predilections and the best he can do, in order to avoid giving a biased opinion, is to base his views on actual experiences. That will be done in regard to the external observations made on the aircraft shown.

One word further in regard to the necessity for external observations. Every exhibit, an internal examination of which must have proved a matter of profound interest, is perched high in the air, e.g. Marcel Bloch 131, Potez 63, Fokker G.1, Amiot, etc., etc., and in general no steps are provided to enable even a cockpit examination ; the only internal views are those obtained through such openings as inspection, navigation, bombing windows, etc., in a wing or body. Therefore let us at once record that to the structural engineer the whole show is profoundly disappointing Typical of the information sought were particulars of how Continental designers tackle the problem of attachment of outer wings to centre-sections on heavy monoplanes having high load factors. To say simply by means of bolts through fittings attached to spar flanges for the direct loads, together with plate attachments between abutting webs for shear transmission, means nothing, for when the compressive force in a flange to be transmitted is upwards of, say, 60 tons, the details of the joints, having regard to the avoidance of concentrated stresses, can be a very difficult job. One must not blame Continental exhibitors for not giving access to those features which one wishes so much to see, since those same exhibitors may have been equally disappointed with the sole British exhibit in the matter of exposition of internal structural detail. Conditions of the "Secret List" is the direct answer to that, and probably supplies the answer to why we had to crane our necks to get a close-up view of many of the aircraft shown.

Visible Support

The methods adopted for supporting some of the aircraft in some cases are certainly daring. The Hanriot 220 has a substantial central support, but the Caudron "Ramier" is poised on a single tubular member of considerable length. There is, however, no evidence of bowing under load, and doubtless the anchorage of the strut under the floorboard is safe. A good engineering job is obtained through the use of three trestles, which eliminate the necessity of surrounding a single strut with ferns, as is done in some cases. Without these decorations the weight from a shoulder might have applied a lateral load to one exhibit at least sufficient to cause the stability condition of the support to become critical. However, the appearance of the aircraft is improved by these elegant means of mounting.

It was to be expected that smooth-skinned bodies and wings would be well in evidence and in this respect, at any rate, there is no room for complaint. The development of the technique of manufacture for the production of such surfaces has been slow in some instances ; a knowledge of the facts easily supplies a reason for that. It can scarcely be said that the latest types of high-speed aircraft have been the result of gradual development ; rather have they resulted from decisions to abandon biplanes in favour of

monoplanes, with the simultaneous adoption of retracting landing gears, flaps, etc., and, of course, the use of high-powered engines fitted with variable-pitch airscrews. There has been a sudden demand for large makes of aircraft and types of the highest possible performance, and while it is recognised that the adoption of flush riveting in place of snaphead riveting results in speed increase, it has also been ascertained that flush riveting, even by the best methods, takes longer than does ordinary riveting, possibly 25 per cent. longer in general as an irreducible minimum. Such an increase, it must be admitted, will ultimately be well worth while, but bearing in mind such questions as possible labour shortage, the matter of all-flush riveting has necessarily had to stand aside as a secondary consideration until the present urgent demands have been met by the quickest methods. Again, no English manufacturer could possibly afford, at the present time, the energy for the production of an aircraft for Show purposes only. One definitely feels that two years at least must elapse before manufacturing technique will have reached the stages when all-flush riveting can be introduced for full production as distinct from the manufacture of prototypes.

Unquestionably, flush riveting as exemplified in the Amiot 220 has a most attractive appearance. In the case of some Continental "mass produced" products flush riveting followed by coach finish is standard, and the only reason for this is that the methods were first introduced three or four years ago, and all attendant problems such as training of labour, "balancing-out" of processes in the shops to cover the extra time required for flush riveting, prime coating, filling, rubbing down, etc., necessary to attain the finish of Continental aircraft have been solved. They started the quantity production of metal monocoque monoplanes some time before us; and that is all there is to be said about it.

Surface Buckles

As to freedom from surface buckles, I do not believe Continental machines have anything in hand in that respect. The appearance of these is often governed, in marked degree, by light and shade, and there was one very interesting case in the Show in which the surface of a set of wings of French design, viewed from the gallery, appeared to be badly buckled, but when seen from a second position the wing was apparently "buckle free." Light and shade effects can only be avoided by the use of thicker sheeting—too large a price to pay for the elimination of an alleged defect that is of no consequence. Apart from exceedingly shallow ripples on practically plain surfaces (i.e., the mid-cord regions of the lower surface of wings) there is a type of buckle that really *can* be of unsightly appearance and is to be found on portions of surface which are not "developable," and which have been covered with hand-worked sheets which do not conform with the shape of the internal framework. There is only one answer to that—assuming the lines are fair—and that is to eliminate the hand-manufacturing process by pressing or drawing or, better still, by a combination of the two processes (This matter may be dealt with at some length in future issues of this journal.) The ideal method, from the point of view of appearance, is the 100 per cent. use of "laid-on" sheet giving maximum possible curvature to all surfaces The leading edge of a wing, for example, or a rounded fuselage are always apparently free from slack metal, since the curvature of the buckles is negligible compared with the general curvature of the sheets. The under surface of any metal-covered wing has only to be compared with the part forward of the front spar for this to be seen.

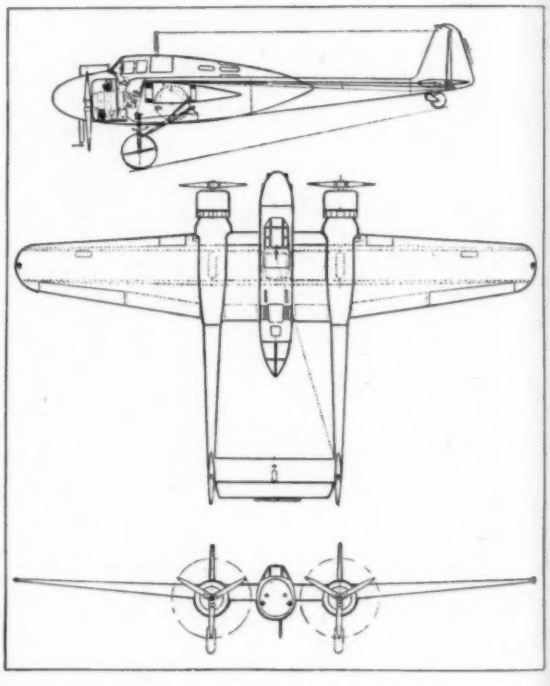
Apart from flush riveting, the pleasing appearance of the French aircraft is due, in no small measure, to the shapes of the bodies, which, in general, are well curved in cross section and are thus free from buckles.

One feels that an apology is needed for making rather a lot of what are really obvious matters, but external appearance is the topic most widely discussed in the Show, for reasons given at the commencement of these notes.

In conclusion, on this point, it must be admitted that French design and manufacture of windscreens are far ahead of anything seen in this country. It is quite impossible to say which is the best, each being excellent. Perhaps pride of place might be given to the windscreen arrangement on the Caudron training machine, with the gunsight fixed in position, because it gives the impression of strength as well as extreme elegance.

Apart from flush riveting, it is of some interest to see how appearance on a finished aircraft is effected by spot welding. An opportunity was presented of forming an opinion on that when viewing the Hanriot 220. Spot welding has also been employed on the Potez. The depressions of the welds, made by the Sciaky method, are, of course, visible and possibly no more pleasing to the eye than are good shallow-headed rivets, but paint would entirely hide the slight depressions and the final result would probably be good, but only an examination of a sprayed spot-welded structure could supply a definite answer to that.

In passing, while one has never waxed very enthusiastic in regard to spot welding—and there is no evidence yet that the method is being generally adopted—yet it is undeniable that considerable progress has been made in the development of machines for doing this work by the Sciaky company. Demonstrations given by representatives of that company at the Show on one of their machines are most impressive; in fact, one is left with a feeling of confidence in their method, yet possibly not until the "tool is brought to the job" and not the "job to the tool" will there be a widespread turning to this method of manufacture of aircraft builders. We were promised that at the next Show light portable tools suitable for aircraft welding would be available and that the welds produced by these tools would be as reliable as those now obtained on the massive deep-throated fixed machine. The machine in its present form appears to be eminently suitable for



Three-view general arrangement drawings of the Fokker G.1.

the production of such elements as wing flaps. As to the old fear of fatigue at the welds, it is stated that no complaint of cracking due to this has been received since the method was first practised six years ago. That being so, the possibility of that happening need carry little weight in arriving at a decision to make the method standard practice, at any rate for parts of secondary importance.

The Sciaky welding plant is only one of several interesting processes on view in the side galleries; the more important of these will be described later. In the meantime we will proceed with an examination of the aircraft shown in the Grand Nef.

Twin Tail Booms

On a first circuit of the Hall the machine that makes first appeal is the Fokker G.1, for the reason that more of the workings of that aircraft are to be seen than any other. The Editor gave a description of this machine in the last issue of *Flight*, so that in order to avoid repetition we will merely state that the wings are of two-spar wooden construction with flywood bakelite wing covering, while the twin outriggers are of metal monocoque construction. Although, as in every other case, it is only possible to view the components externally, yet such examination was, for once, of interest.

The covering has been laid on circumferentially, and apparently there are no stringers; at any rate, circumferential rivets only are to be seen. The reduction of internal framework to a minimum is, of course, an excellent thing, but this can only be done through the use of well-curved sheets and/or relatively thick plating. The upper and lower portions of the outriggers have a radius of curvature which ensures high stress development for vertical loading in either direction, but the sides, particularly in the region of the wing trailing edge, have great radius of curvature and, judging by the plate thickness, which does not appear to be greater than 22G, it is probable that a relatively low stress only would be capable of development in these plates. It is, of course, certain that the booms are adequately strong against sideways (fin and rudder) load. It is simply wasteful to provide unnecessary strength in an aircraft structure, and every row of rivets should be saved where possible.

Monocoque Construction

Speculation on the nature of the internal framework of a monocoque fuselage is simply waste of time, but bearing in mind that the moment of inertia of these booms varies as the fourth power of their diameter, and that their sectional area is definitely much less than the fuselage of normal design, one would not have been surprised to see external evidence of internal stringers on the flattish sides of the boom roots.

Although the wings of this aircraft are of timber construction, the tailplane is made up of four duralumin spars interconnected with dural ribs, the whole being covered with "Duralplatt" sheet. The tailplane spars are connected to the outriggers by eight bolts on each side. The two fins are unbraced and are constructed in the same way as the tailplane, namely, with dural spars and ribs covered with "Duralplatt" sheet. They form one unit with the outriggers.

The reader is referred to page 544 in last week's issue of *Flight* for a view of the empannage and outrigger arrangement, which sketch shows the rear rotatable turret in position; this certainly gives one the impression of being a most effective piece of armament. The whole layout of this aircraft is so profoundly interesting that three-view G.A. drawings are included in this article. Many of the features of Fokker construction to which we have become accustomed are, of course, included in this exhibit. For instance, the elevators and rudder are of welded chromemolybdenum tubular framework, fabric-covered. Incidentally they are balanced statically and aerodynamically, and are fitted with trimming flaps which can be adjusted during flight. The fuselage similarly is of welded construction.

The method of joining the outriggers to the wing is interesting. As the root of the rearwardly extending booms merges into the wings the material of construction is changed to wood and is constructed integrally with the wing. This section is made in such a way that a plywood monocoque transfers the stress to the reinforced box ribs which carry the engines and border the space into which the undercarriage is retracted. The metal outriggers are secured to this structure by means of bolts.

On the adjacent stand is shown the U.S.S.R. A.N.T. 25 (900 h.p. M.25 liquid-cooled Vee 12 motor). There is one feature of structural interest in regard to the design of fuselage of this aircraft. The fin and rudder are of the same generous proportions to which we have become accustomed on British designs, while the fuselage tapers enormously to a point near the fin anchorage and the shear arising from the fin and rudder loads has at some time or other been sufficient to induce permanent tension diagonals in the sheet covering. This appears to be a pronounced case of overstressing, according to our standards, although actual failure is usually far distant from the point at which Wagnerian waves become permanent. Either a thicker skin was required at the rear of the fuselage, or closer spacing of the hoop members.

Ridges

There is little else of structural interest in the Russian aircraft; the fore-and-aft ridges on the wings of the long-range monoplane, reminiscent of early Wibault construction, are noticeable among the galaxy of smooth-skinned wings, but such ridges cannot have much effect on the speed of a machine of medium performance.

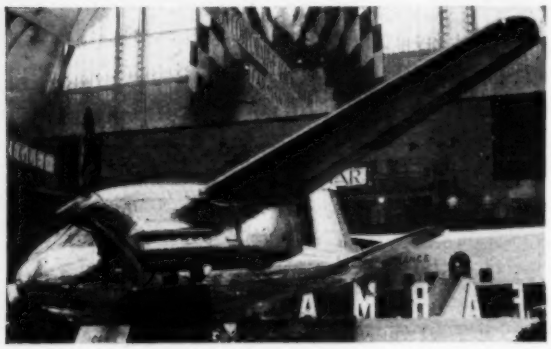
Undercarriage retraction is effected in a simple way on the A.N.T. 35; merely the usual direct hydraulic pull on a folding radius rod, but the mechanical means of closing the doors of the aperture are new to the writer. Sufficient can be seen in the relevant sketch on page 554 of *Flight* of November 19 to indicate how rods and universal joints can be used for this purpose. These, however, are all working parts and it would certainly seem as though fairing secured permanently to the moving undercarriage parts would result in an effective and more trouble-free arrangement.

The question of operation of doors closing bomb cells and undercarriage openings is one of the secondary matters that calls for some thought. Hydraulic operation is expensive both in cost and weight, compared with, say, the use of bunjy, but it is certainly more positive and is likely to be generally adopted. On the Fokker G.1 the bomb doors are hydraulically operated, while those for the undercarriage opening are closed by tensioned rubber bands.

Many good words were said in regard to the low-winged twin-engined monoplane shown on the Potez stand; the spacing of the rows of rivets in the fuselage and wings indicates an arrangement of internal framework that we now regard as good practice so far as giving adequate stiffness to the skin is concerned. To the structural engineer the most important feature of this machine is the employment of a completely detachable bottom wing surface. It appears to the writer that this has manifold advantages. The critic at once asks "What about screwing home the thousands of screws necessary for this arrangement?" The only answer is, "What about inserting and upsetting thousands of rivets that are difficult of access?" I have long been convinced that a completely detachable undersurface is the only rational way of building such relatively shallow structures. When such questions as periodic inspection and ease of repair are introduced into the discussion, the completely built-up wing has a poor case indeed, but for purely manufacturing reasons alone the detachable surface "has it." This method of wing construction is also practiced by Marcel

Bloch and Hanriot as an examination of their respective aircraft showed.

For reasons of inaccessibility there is little else to be said in regard to the Potez. A view through an under-surface door revealed a spar having a continuous web; this was noticed in one or two other cases and in the use of such webs the French designers are to be congratulated. This method of construction has every advantage over latticed web spars without, so far as my experience goes, as ingle disadvantage. It is clear that the spar booms are of heavy sectioned metal—presumably of extruded dural. With the high tensile light alloys that have recently become available the use of these alloys in extrusion form is surely indicated; machining these sections to get a boom of uniform strength is a matter of some difficulty, and information as to how this could be done without attendant warping troubles was kindly given by engineers on one of the French stands.



The Hanriot 220, like the Potez and Bloch, has a completely detachable bottom wing surface.

One would regard the dihedral angle of the tail plane on the Potez as a nuisance structurally, but if the necessity for rudder ground clearance forces this, there is nothing more to be said about it. Some aerodynamic advantage would certainly accrue from its use in addition to the aerodynamic advantage gained by placing the fins and rudder at the tailplane extremities, but a break in the middle of a spar costs weight and money, although in the case of the tailplane spar the problem is not complicated by extremely high flange loads.

(To be continued.)

A NEW "FAMILY" of AEROFOIL SECTIONS

American N.A.C.A. introduce Sections which combine High Maximum Lift with Good Efficiency

AN extensive investigation of a large number of related aerofoils, made by the American National Advisory Committee for Aeronautics in the N.A.C.A. Variable-density wind tunnel, has indicated that the increase in maximum lift with increasing camber is more rapid as the maximum camber is moved forward from a point near the 0.3 chord position. A later series of related aerofoils was developed, having mean-line shapes derived to permit a forward extension of the maximum-camber position. All these sections were of the same thickness (12 per cent. of the chord), but the maximum-camber position varied from 0.25 c to 0.05 c behind the leading edge. These tests indicated that aerofoils with a range of camber positions forward of the normal positions possessed improved characteristics. One of the best of these, the N.A.C.A. 23012 having the maximum camber at 0.15 c behind the leading edge was afterwards chosen as representative of this group of improved aerofoils. This new aerofoil section was first announced at the Ninth Annual Aircraft Engineering Research Conference held in May, 1934. Because of the marked interest in this section, tests of a 6ft. by 36ft. model of the N.A.C.A. 23012 were made in the N.A.C.A. full-scale tunnel to verify the characteristics found for this aerofoil in the Variable-density tunnel.

N.A.C.A Technical Note No. 567 has been prepared to satisfy a demand for data on the N.A.C.A. 230 series of aerofoils of varying thickness. The data are of value mainly in connection with the design of tapered wings.

Technical Note No. 567 contains results of tests on six aerofoils of the following thicknesses: Six, nine, twelve, fifteen, eighteen, and twenty-one per cent. respectively. The variation of the aerodynamic characteristics with thickness as shown by these data is in agreement with previous findings. The angle of zero lift remains practically the same throughout the range of thicknesses tested, while the slope of the lift curve decreases considerably with increasing thickness; the position of the aerodynamic centre is somewhat farther forward for the 18 and 21 per cent. thickness aerofoils than it is for the thinner aerofoils.

Generally speaking, the results indicate what one would expect, namely that the "best" section, aerodynamically, is one of moderate thickness. All six sections are characterised by an upper camber situated at 20-25 per cent. of the chord from the leading edge, while the lower camber (negative, of course, the sections being of the bi-convex type) is located at about 40 per cent. of the chord from the leading edge.

The greatest lift coefficient obtained was 1.68 (full-scale value) for the twelve per cent. thickness section; the greatest L/D was approximately 25 (for the six per cent. thickness section), but an L/D of 20 or more was found for all the sections up to eighteen per cent. thickness, so that where structural considerations demand a fairly thick section the 230 series seems to be very efficient.

Finishing Aluminium

A PAMPHLET describing the methods of finishing aluminium, under the headings, Polishing, Cleaning, Frosting, Scratch Brushing, Sand Blasting, Painting and Enamelling, and Anodising (the last-named process in great detail) has been published by the British Aluminium Co., of Adelaide House, King William Street, London, E.C.4.

Fireproofing

IMPERIAL CHEMICAL INDUSTRIES have developed a new agent, "Faspos" which, it is claimed, renders wood, paper and other material fireproof. A booklet dealing with the preparation, application, effect on material, and testing of "Faspos" can be obtained from I.C.I., Thames House, Millbank, London, S.W.1, or the nearest I.C.I. sales office.

FUSELAGE STIFFNESS

The Torsional Vibration of a Conically Tapered Shell Fixed at One End and Carrying a Mass of Appreciable Moment of Inertia at the Free End

By J. MORRIS, B.A.

NOTE. *The investigation which follows may be applied to the case where the rear portion of the fuselage of an aeroplane is in the form of a conically tapered shell, the tail unit being regarded as a mass of appreciable moment of inertia at the end.*

Referring to Fig. 1, let the base of the body $B_0A_0B_0^1A_0^1$ be an ellipse of semi-axes $OA_0 = a$, $OB_0 = b$. Let OX be an axis through O the centre of the ellipse and normal to its plane. Let the normal cross section of the body at a distance x from O be an ellipse similarly situated to the basic ellipse and having semi-axes $a\left(1-\frac{x}{l}\right)$, $b\left(1-\frac{x}{l}\right)$. Let the length of the body be L. If the body tapered to a point then L would be equal to e. Let the thickness of the body be t, which is supposed small compared with a or b.

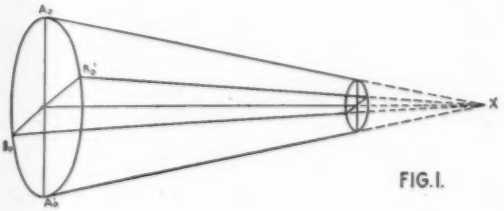


FIG. 1.

For the case of a cylindrical prism of constant elliptic section and fixed at one end we have by Batho's formula

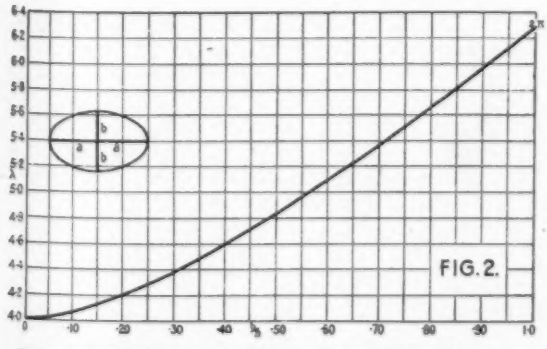
$$T = \frac{4A^2Ct}{s}\frac{\theta}{l}$$

where T is the torque applied at the free end, θ the angular twist due to this torque, A the area, enclosed by the ellipse, s = perimeter of the ellipse, t the thickness of the shell, and C is the modulus of rigidity for the material.

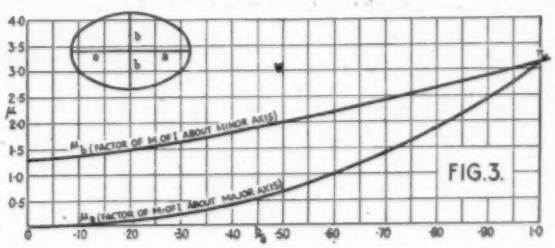
Now for an ellipse

$$s = \lambda a$$

Where λ is a constant depending on the ratio of $\frac{b}{a}$ which ratio is regarded as varying from zero to unity. When $\frac{b}{a} = o$ clearly $\lambda = 4$ and when $\frac{b}{a} = 1$ $\lambda = 2\pi$. The value of λ for varying ratios of $\frac{b}{a}$ is given in Fig. 2. Fig. 3, which gives the principal moments of inertia of the cross section of a thin elliptic tube, is also included for reference.



Perimeter of ellipse, = λa, where 2a = major axis, 2b = minor axis. λ = function of b/a. (R.A.F. Official. Crown Copyright reserved.)



Moments of inertia of cross section of thin elliptic tube. Ia = μa a³ t ; Ib = μb a³ t, where 2a = major axis, 2b = minor axis, and t = thickness. μa, μb = functions of b/a. (R.A.F. Official Crown Copyright reserved.)

Consider now the body illustrated in Fig. 1 with a torque T applied at the free end, then for a slice between the normal cross sections at x and $x + dx$ from O we have

$$T = \frac{4\pi^2a^2b^2\left(1-\frac{x}{l}\right)^4 Ct}{\lambda a\left(1-\frac{x}{l}\right)}\frac{d\theta}{dx}$$

where θ is the angular twist at the point x.

Hence $$\frac{d\theta}{dx} = \frac{\lambda T}{4\pi^2ab^2Ct}\frac{l^3}{(l-x)^3}$$

So that $$\theta_x = \frac{\lambda T}{4\pi^2ab^2Ct}\int_0^x \frac{l^3}{(l-x)^3}\,dx$$

or $$\theta_x = \frac{\lambda lx\left(l-\frac{x}{2}\right)T}{4\pi^2ab^2Ct(l-x)^2}$$

If the length of the body be L then

$$\theta_L = \frac{\lambda lL\left(l-\frac{L}{2}\right)T}{4\pi^2ab^2Ct(l-L)^2}$$

or $\theta_L = T\phi_{LL}$

where ϕ_{LL} = angular twist due to unit torque.

Thus $$\phi_{LL} = \frac{\lambda lL\left(l-\frac{L}{2}\right)}{4\pi^2ab^2Ct(l-L)^2}$$

Suppose now that we have a body at the free end of relatively large moment of inertia I about the longitudinal axis of the tapered body then in torsional vibration

$$\theta_L = -\frac{I}{g}\ddot{\theta}_L\phi_{LL}$$

Let $\theta_L = a_L \cos(kt + \epsilon)$

Where a_L is a constant, $\frac{k}{2\pi}$ a frequency and ϵ an epoch angle, then

$$\frac{1}{k^2} = \frac{I}{g}\phi_{LL}$$

Thus we find that

$$\frac{k}{2\pi} = a^{\frac{1}{2}}b(l - L)\sqrt{\frac{Clg}{\lambda l L\left(l - \frac{L}{2}\right)I}}$$

If the taper instead of being linear is parabolic then

$$a_x = a\left(1 - \frac{x}{l}\right)^{\frac{1}{2}}$$

$$b_x = b\left(1 - \frac{x}{l}\right)^{\frac{1}{2}}$$

so that

$$\frac{d\theta}{dx} = \frac{\lambda T}{4\pi^2 ab^2 C}\left[\frac{l^2}{(l-x)^2}\right]$$

or

$$\theta_x = \frac{l\lambda T}{2\pi^2 ab^2 C l}\left[\frac{1}{\left(1 - \frac{x}{l}\right)^{\frac{1}{2}}} - 1\right]$$

Hence in this case

$$\phi_{LL} = \frac{\lambda l}{2\pi^2 ab^2 C l}\left[\frac{1}{\left(1 - \frac{L}{l}\right)^{\frac{1}{2}}} - 1\right]$$

$$\frac{1}{k^2} = \frac{I}{g}\phi_{LL}$$

$$= \frac{1}{g}\frac{\lambda l}{2\pi^2 ab^2 C l}\left[\frac{1}{\left(1 - \frac{L}{l}\right)^{\frac{1}{2}}} - 1\right]$$

So that

$$\frac{k}{2\pi} = a^{\frac{1}{2}}b\sqrt{\frac{Clg}{2\lambda l\left[\frac{1}{\left(1 - \frac{L}{l}\right)^{\frac{1}{2}}} - 1\right]I}}$$

To take a numerical example let

$a = 23$ in. $\quad l = 168$ in. $\quad t = 0.036$ in.

$b = 16$ in. $\quad L = 112$ in. $\quad C = 4 \times 10^6$ lb./in.^{2}

$I = 450 \times 144$ lb. in.^{2}

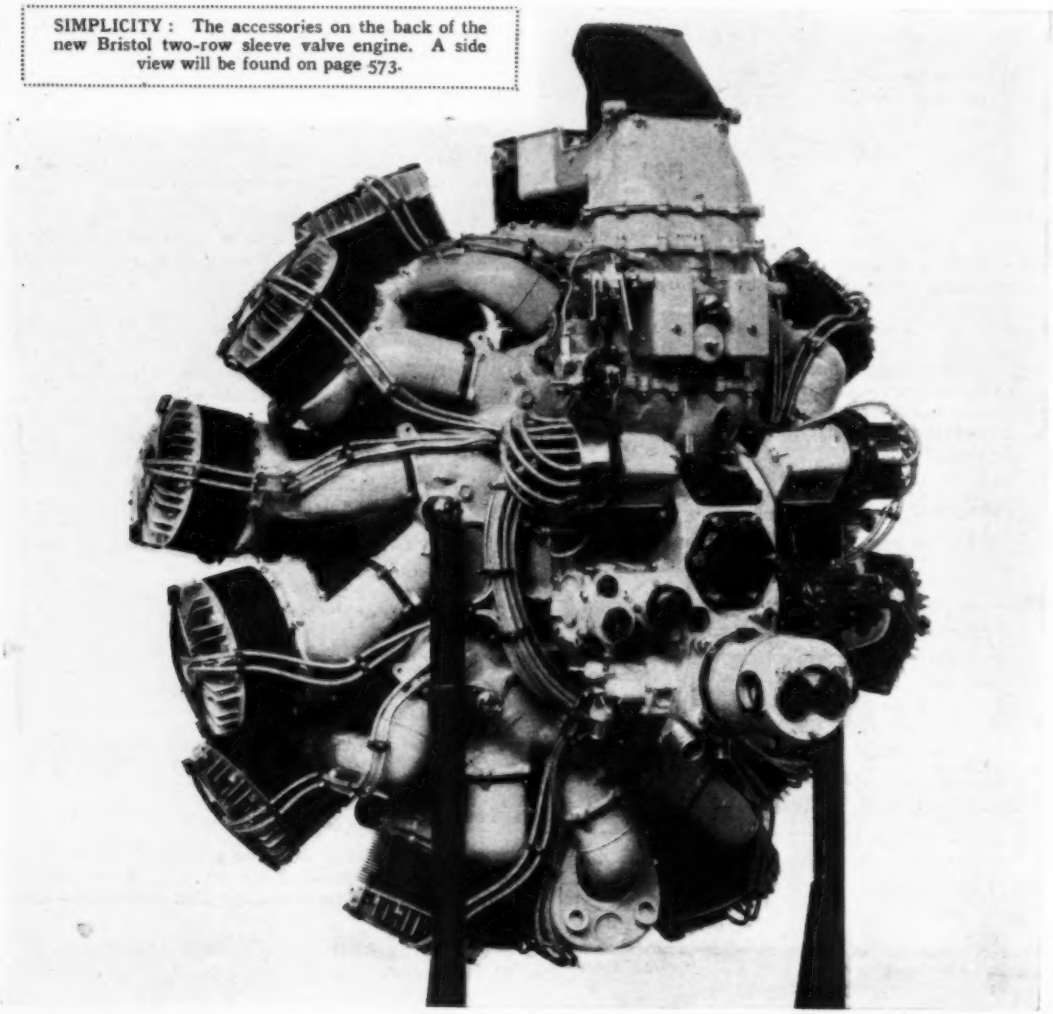
then for the linearly tapered case

$$\frac{k}{2\pi} = 23^{\frac{1}{2}} \times 16 \times 56\sqrt{\frac{4 \times 10^6 \times 0.036 \times 384}{5.27 \times 168 \times 112^2 \times 450 \times 144}}$$

$$= 37{\cdot}6 \text{ v.p.s. app.}$$

or $\frac{k}{2\pi} = 2260$ v.p.m.

SIMPLICITY: The accessories on the back of the new Bristol two-row sleeve valve engine. A side view will be found on page 573.



Private Flying

Topics of the Day

Q.B.I.

THE past week has been a pretty hopeless one from the private owner's point of view, and it is difficult enough to see how Q.B.I. conditions can ever be combated by him—with safety for himself *and* the other fellow. Just as soon as we start to imagine suitable radio and other devices which will enable him to fly at least in reasonably bad conditions, we realise again that he is only an amateur and that, generally speaking, radio operation is a full-time job demanding full-time practice—though the R/T examination is simple enough.

Nevertheless, nothing will induce me to fly in visibility of less than 1,000 yards—even if the Air Ministry will let me—without some sort of radio guidance. Several times, in poor visibility and pouring rain, I have actually lost an aerodrome while doing wide circuits, and have spent an exceedingly frightening five minutes systematically combing the immediate vicinity. Nothing is so absurdly elusive as an aerodrome, and nothing can be more annoying than the realisation that, though firmly out of sight, it is only just around the corner. Once it happened in my early days while using, only for the second time, a certain machine which had to be brought in very carefully; I derived no comfort from a sight of the lush meadows down below, since I did not think I could get into any without committing overshootment.

Radio Possibilities

IF, on the other hand, my machine had, in each case, been fitted with some quite simple form of homing device, and if the aerodrome itself had been equipped with a constantly-operating transmitter, each having a fixed wavelength, that part of the problem, at least, would have been solved.

Obviously we cannot have private owners barging all over the sky any more than we can have motorists driving wherever they prefer on our roads; nor can we have them dashing from here to there when the "here" visibility is reasonably possible and the "there" conditions are just impossible. Definite rules would need to be laid down, and private owners would have to take a much more intensive interest in meteorological reports.

For this reason the constant broadcast from the more important aerodromes should be in the nature of a weather report, either in clearly defined code form or in speech. There is nothing technically impossible about this, since simultaneous radio beam signals and weather reports have been made in America.

Even two-way radio is not quite an impossible prospect provided that the work is carried out on short waves, though this is yet another item of expense both for the airport and the aeroplane owners. One company has recently produced a special short-wave set, working on four fixed wavelengths, and weighing only 40lb.

The Future

HOWEVER, nobody is going to bother much about private owners so long as they are numerically unimportant and so long as they are themselves satisfied to wheel their machines into the hangars for the duration of the winter. At present one can hardly blame them.

You may hang about at a remote aerodrome for a solid week waiting for safe flying conditions—safe, that is, for the pilot who must depend on dead reckoning and map reading by themselves while making a cross-country.

Consequently, if we *must* traverse the country in such conditions, we usually pick out a nice main-line railway, deficient in tunnels, and rush along it muttering prayers or imprecations, while wishing that we had never left home and while dodging the streams of water which are entering the cabin from unexpected places. There is no point in pretending that the experience is pleasant, and I shall leave it to the enthusiastic theorists to bawl about "flying for everyone—all the year round." The elusive Mr. Everyman will prefer the nice warm train, with lunch to time, until his navigational difficulties are reduced.

Which reminds me of the quite untrue story told by a well-known private owner. He was "jumping signal-boxes" when he noticed, ahead of him, a hump-backed bridge with the signal against him. Though hardly in his right mind, he still knew that he wasn't a train and, in any case, the signal moved to the "all clear" just as he arrived. Unfortunately, he forgot that this type usually moves *above* the horizontal—and he lost all the fabric from the bottom of his fuselage, or so he said.

Some Problems

REMEMBERING the considerable troubles experienced by both air and ground radio operators on the still fairly empty air routes, two-way radio for the private owner may, in any case, prove to be virtually useless. Even now, pilots or their operators are tearfully implored to do as little transmission as possible in order to leave the air free for the messages of those who really need assistance.

A freighter pilot once told me that he had to hang about Le Bourget for so long, while another pilot was being brought in on bearings, that he eventually had to come down as well as he could without any such assistance. He landed successfully in a market garden, but the last half-minute of his descent through the fog must have taken ten years from his expectancy of life.

Imagine the conditions if two dozen private owners were crying out for weather reports or for permission to land all at the same time, while the crew of some machine, full of rotund passengers, were cholerically listening to their little voices. Hence, in part, my demand for short-wave two-way equipment. My other reason, of course, concerned the fact that, within limits, the shorter the wave used the more compact is the set.

INDICATOR.

Private Flying

FROM the CLUBS

Events and Activity at the Clubs and Schools

LONDON

CLUB machines put in only 54 hr. 15 min. last week, the weather still being very bad. New members are Messrs. W. Rathbone and R. Wilson.

MIDLAND

In spite of high winds and fog last week the flying times totalled 11 hr. solo and 7 hr. 30 min. dual. New members who joined during the week were Messrs. W. B. Arnold and L. V. Mann, and cross-country flights were made to Heston, Norwich, Walsall and Tollerton.

BORDER

Gales and heavy rainfall have curtailed flying considerably. Preparations are well advanced for another annual cabaret ball. Machines are expected from Edinburgh, Dublin, Glasgow, Newcastle and London. Members are using the Club machines for business purposes to a greater extent than formerly.

C.A.S.C.

No machines were taken up during the week-end, owing to a dense fog. No. 4 (Kent) Squadron of the Corps has been officially inaugurated at Dartford. All enquiries for this squadron should be addressed to W. E. Lockyer, Commanding Officer, No. 4 (Kent) Squadron, 99, East Hill, Dartford, Kent. Mr. C. W. Wade has gone solo.

LIVERPOOL

During the month of October eight flying members and fourteen associate members joined the Club, but high winds and rain seriously curtailed flying, bringing the total for the year to 2,092 hr. 15 min. The annual ball will be held at the Adelphi Hotel on Thursday, December 3, starting at 8 p.m., a map-reading competition will take place at Speke on Sunday, November 29, and a landing competition will be held at Hooton on Sunday, December 6.

READING

Due to extremely bad weather there has been little flying done at the school, the total for the past two weeks being 55 hr. 15 min. New pupils are Mr. Pusey and Mr. Masterman from Australia. Major Parker, who has purchased a Whitney Straight, is flying at the school, while Mr. and Mrs. Brown have bought a King's Cup winner—ADLC. Miss de Bunsen, who learned to fly at Reading five years ago, came to be passed off in a Hawk Major, which she managed in half-an-hour.

NORTHAMPTONSHIRE

Flying hours recorded for the week were very satisfactory and compared well with summer months. First solos were made by Messrs. Cleaver and Chattaway, and Mr. Louis Wood is now ready to take his tests for the "A" licence. A recent dance held by the Club attracted over 150 members and friends and it is hoped that the next one, to be held on December 18, will prove as popular. New members include Miss Benson and Mr. Wilkinson, who has some 80-odd hours to his credit on Autogiros.

YAPTON

Flying times for November to the 21st totalled 51 hr. 45 min. Mr. D. M. Lahiri has commenced tuition for his "A" licence, and Mr. John Hunter has completed his second cross-country flight for his "B." Mr. Gilbert Lancaster has gone solo.

HANWORTH

The aerodrome was fog-bound for the greater part of last week, consequently flying time dropped to thirty hours. The Aeroncas are still very popular and many people have joined the Club recently for instruction on this type of aircraft. New members are Mr. A. W. Iredale and Mr. Berrington.

BRISTOL

Club members flew 11 hr. 45 min. during the week ended November 21. Mr. W. Rudman and Mr. R. W. Rivett have joined as members and Mr. A. D. Brodie has gone solo. Although flying hours have been down considerably this month, there are fourteen members under active instruction and, given fine weather, the figures should considerably increase.

SOUTHEND

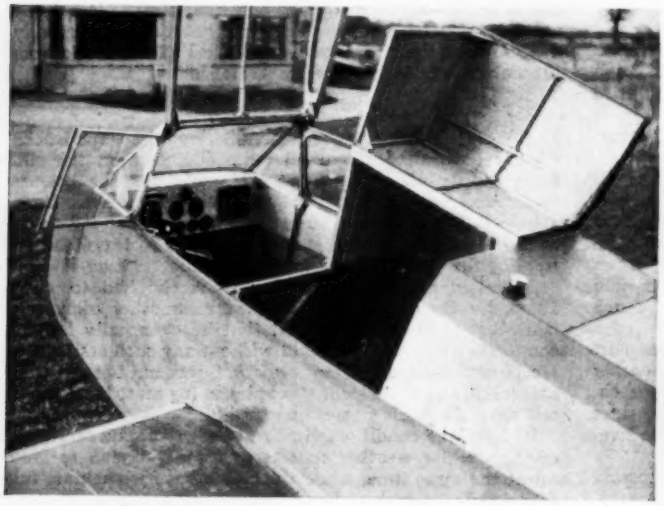
In spite of indifferent weather conditions during the past week a considerable amount of advanced training was carried out. The Club Tipsy has now arrived at Croydon, so that it may be expected at Southend in the near future. The fine weather over the week-end brought great activity and the machines were seldom idle. Last Friday the monthly supper and smoking concert was held and was exceptionally well attended. Many guests from neighbouring flying clubs were present.

BROOKLANDS

Days of high winds, fog and rain have hampered flying times during the week, but school aircraft were kept busy when weather permitted. New members include Messrs. Todd, Carrigan and W. Duschinsky, and height tests were carried out by Miss Paget, Mr. P. Gush (who had otherwise completed his "A" licence tests), Mr. Crouchley and Mr. Blundell. Several members and instructors flew down to Shoreham airport last Friday afternoon for the annual dinner and dance of the South Coast Flying Club. The height judging competition held last Sunday week was won by Mr. Symondson.

HERTS AND ESSEX

During the fortnight ended November 20 Club aircraft flew 145 hr. 56 min. New members are Messrs. W. K. Degenhardt, C. Kennett, H. Bunn, W. H. T. Andrews and H. S. Olding. Messrs. Frogley and Nock have returned from their Continental tour in the Swallow. Membership at the Gravesend branch is still increasing. Six members have gone solo and eleven others are under instruction. Messrs. P. M. Bristow and H. G. Small are taking the "B" licence. Members and friends who have not yet obtained tickets for the sixth annual dinner and dance, to be held at the Park Lane Hotel on December 3, are requested to make early application.



STILL NEARER : With a general layout similar to that suggested on more than one occasion by "Indicator," the new Heston twin-engined lightweight was first illustrated in *Flight* of November 12. Here, on the left, is a view of the cabin and the luggage "hold." On the right is Mr. Hordern (left) with the Duke of Richmond and Gordon; they are the conspirators in this delightful plot. (*Flight* photograph)

CROYDON

Last week the weather persisted in keeping the machines grounded most of the time, though the Club managed to do twenty-two hours' flying. Mr. D. W. Jorge made a successful night flight from Croydon to Lympne for his "B" licence. Mr. R. F. Graesser has passed all his tests for a "B" licence and Mr. W. C. Carswell goes to Hendon next week for his tests.

CAMBRIDGE

The flying times at Marshalls' Flying School for the week ending on November 22 totalled sixty-five hours. First solos were completed by Miss Weller-Pooley and Mr. Calthrop, while Mr. Danby passed his "A" tests. Messrs. Turner, Singh, Constant and Knight have joined the School. No flying could be done on the 18th owing to high wind, or on the 22nd owing to thick fog. Three members flew to Paris for the week-end in the Puss Moth.

CINQUE PORTS

Owing to adverse weather conditions, the low total of twenty-six flying hours was recorded for the past week. Next Saturday, November 28, the Club is holding a dance in the hangar, which will be followed by a light supper at midnight. Last Friday two members flew to Shoreham in the Leopard for the annual "do" of the South Coast Flying Club. Mr. J. Gann has joined the Club to take his "A" licence, and Mr. R. A. R. Chalmers has made a successful night flight from Croydon to Lympne. Meanwhile, Mr. W. E. Davis has unfortunately found it necessary to enter a nursing home for a slight operation.

NORFOLK AND NORWICH

Just over twenty hours' flying was logged last week. Of this, ten hours were flown during the week-end, which was an exceptionally good one. Messrs. W. J. Jamieson and J. L. Hanly have passed their "A" licence tests. The next event in the social activities of the Club will be a supper dance on Friday, December 4. On the retirement of Mr. J. C. Cracknell, the Club's chief steward, a presentation from the members was made in the shape of a gold watch. In future a series of lectures on first aid will be held and it is hoped that as many members as possible will attend in order to have a number of capable people available whenever needed.

HULL

Flying times for October totalled 57 hr. 50 min. Mr. C. D. Cast has obtained his "A" licence.

REDHILL

For the week ended November 20 flying times totalled 37 hr. 5 min. Two machines went over to Paris for the Aero Show, and Mr. Ditton has gone solo.

KARACHI

The absence of the Club's pilot-instructor caused a slight lull in flying activities. From May to August the inclusive flying time was only 346 hr. 10 min. Upon Major Jones' return there was a marked increase in flying time which, during September, rose to 155 hr. 15 min. The Club's fleet now consists of three Gipsy Moths (one equipped for instrument- and night-flying), one Leopard Moth, and a new Hornet Moth.

A. S. T.

The wireless training course at Air Service Training is becoming very popular and ten pupils are taking the new course which commenced in September. At the last wireless examination four pupils passed and obtained the P.M.G.'s W/T air operator's licence. Four former students have returned to the School—Capt. Murdoch, Mr. Hall and Mr. Aga—and Mr. M. Burton, who attends for a short course every year, has rejoined for a few days' special flying instruction. New pupils are Mr. Warren, who has joined for flying on various types, and Mr. El Kafrawy, of Egypt, who has joined for the ground engineers' course. Twelve pupils commenced the navigators' course in September. A total of 1,401 hours was reached during October, the visitors including the Hon. D. H. Drummond, the Minister of Education in New South Wales, Mr. Law, the Vice-President of the Penang Aero Club, Mr. Ishida, a civil engineer of the Japanese Government Railways, and Sqn. Ldr. Sherger, of the R.A.A.F., who is interested in the method of conducting instrument flying on large aircraft. A "dining-in" night was held during October, when trophies were presented to the winners of the Gardner, Sopwith and Minchin competitions.

Eastbourne's First

ALTHOUGH its new president, Mr. Hore-Belisha, was unable to be present, the Eastbourne Flying Club's first annual dinner and dance, held at the Grand Hotel, Eastbourne, last Friday, was well graced with those who (usually against their will) are known as celebrities.

For instance, among the visitors were Mrs. Markham and Sqn. Ldr. Swain, and also Flt. Lt. Tommy Rose and Mr. Claude Grahame-White, both of whom contributed what used to be referred to as a few well-chosen words.

Other speakers were the Mayor of Eastbourne (Councillor J. Wheeler, J.P.), Capt. H. A. Love (chief instructor), Capt. E. I. Short (hon. secretary), Councillor A. E. Rush, Mr. William Courtenay, Alderman Miss E. M. Thornton, J.P., and Major E. Tuppen, M.C.

Many of the speeches centred on the possibility or otherwise of a municipal airport. Two sites are on the *tapis*, but a majority on the Council has vetoed all proposals for the time being. However, the energetic Capt. Short and his supporters are exploring every stone and leaving no avenue unturned, so all hope is not yet lost. They are trying to impress the urgency of at least reserving a site, even if no actual construction is undertaken.

Capt. Short, incidentally, announced that extensions may shortly be made to the Club's present 49-acre aerodrome at Wilmington, though this must retain the termination "-drome" and can never, apparently, acquire the more impressive one of "-port."

Capt. Love carries out his instructional duties on B.A. Swallows, and the Club announces itself as willing to educate any normal enthusiast in ten hours at a cost of £17 10s.

South Coast Social

SPEECHES were short and to the point at the South Coast Flying Club's dinner held last Friday at the Grand Hotel, Brighton. Sir Francis and Lady Shelmerdine were the guests of honour, and the necessary formalities consisted almost solely of a toast to the guests, proposed by the chairman, Mr. Francis Haddock, and a reply, of course, by Sir Francis. Unfortunately, the Club's president, the Duke of Norfolk, was unable to attend.

After acknowledging the honour done to the Club by the presence of the Director of Civil Aviation, and speaking of the important help given by Alderman Carmichael, chairman of the airport committee, Mr. Haddock proceeded in a lighter vein. He described the occurrences at the world's biggest dawn patrol when no fewer than sixty-eight machines arrived at Shoreham, and his experiences when competing for Mrs. Gorringe's forced landing trophy. He mentioned, too, Mr. White's work in organising, largely at his own expense, a Junior South Coast Instructional Club, in which younger people have a chance of learning something about this flying business.

Sir Francis Shelmerdine spoke of the remarkable results obtained during the comparatively short life of the Club, which was working from a really historic site, and, in this connection, did not forget to remind everyone of the chief instructor's record. Mr. Pashley took his ticket (No. 106) in 1911 and had been at Shoreham more or less consistently since that time. After giving due praise to Mr. M. H. Volk, Sir Francis went on to impress the national importance of the club movement.

By way of a reply for the Club—or rather for the group of clubs—Capt. Duncan Davis wound up the proceedings with a good story and with thanks for all the help he had received during the year. Lady Shelmerdine then presented the Gorringe Trophy to Mr. P. Mursell, and the guests repaired to the dance floor.

Ground Training

THE County Flying Club, Leicester, which was formerly known as the Leicestershire Flying Pou Club, is the first to use the Kronfield ground trainer which was recently described. Five members have graduated for first solo flights on the Club Drone, though none of them had previously flown an aeroplane before. Instruction on the trainer can be had for 9s. an hour and the Drone itself can be flown for 15s.

The instruction has been supervised by Mr. Kronfeld, who, incidentally, is letting the Club have the first use of his latest development—a trainer which flies, but only just.

In order to give the pupils a better idea of the correct position of the horizon in a proper machine, a horizontal bar has been rigged up above the nose of the Drone. After getting used to the trainer, which has more powerful controls, pupils are transferred to the Drone and graduate from straight ground runs to straight hops and circuits. The first circuit, presumably is in the same category as a first solo in a normal machine.

Mr W. Lindsay Everard, M.P., who is president of the Club, is taking a keen interest in its progress and both the trainer and the Drone, as a matter of fact, are gifts from him. He is also lending his own Ratcliffe aerodrome for their solo work. The members who have already made their first solos include Messrs. W. M. Fraser, A. S. Carter, C. St. L. Jervis, A. Brewin and H. Rawnslev.

AROUND the GALLERIES

British Accessories and Equipment Well Represented at the Paris Aero Show

NEARLY twenty British firms engaged in the manufacture and/or distribution of aircraft accessories, instruments and equipment are exhibiting at the Paris Aero Show, which remains open until next Sunday, November 29. Such enterprise is highly commendable and looks like bearing good fruit, the number of serious enquiries reported being very considerable. Both in design and workmanship the British products stand comparison with anything exhibited by foreign firms, and in view of the increasing importance of the equipment installed in modern aircraft, that is a highly satisfactory state of affairs. Generally speaking, the products exhibited by the different firms are well known to readers of *Flight*, and detailed descriptions are scarcely necessary. It is, however, of interest to record briefly what each is showing.

Since he resigned from the technical staff of the Gloster Aircraft Co., Ltd., some years ago, Mr. G. H. Dowty has built up his firm, Aircraft Components, Ltd., to hold a very important place in the British aircraft industry, and there are now few British aircraft which do not incorporate one or more of the Dowty specialities such as undercarriage units, hydraulic retractor gear for undercarriages and flaps, internally-sprung wheels and so forth. At Paris Mr. Dowty is showing a stub wing of a Heston Phœnix, which incorporates the "sideways-retracting" undercarriage. "Backwardly-retracting" undercarriage gear is also shown as well as the internally-sprung wheel of the type used on the new Gloster Gladiator single-seater fighters.

Anglo-French

The Exactor Control Co., Ltd., makers of the well-known hydraulic remote control, are represented at the Show on the Messier stand, the Société Française de Materiel d'Aviation being the French licensees.

Gallay, Ltd., show aircraft radiators, oil coolers, cabin heaters, and magnesium and duralumin riveted tanks.

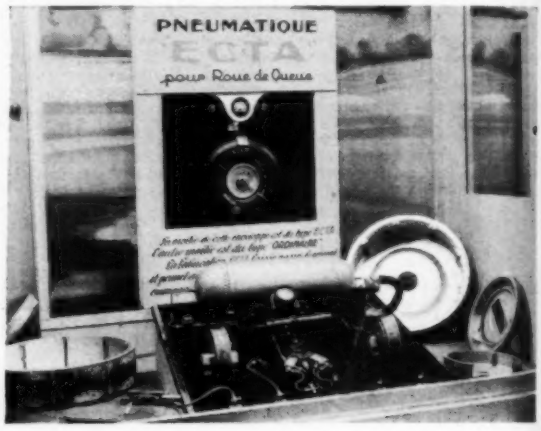
No firm has played a greater part in developing automatic engine controls than H. M. Hobson, Ltd., and at Paris this firm exhibits a range of carburetters, master-control carburetters with variable datum boots control and automatic two-stage mixture control, and pilot's cockpit control.

A complete range of sparking plugs in 12 mm., 14 mm. and 18 mm. threads is shown by Lodge Plugs, Ltd.; also Lodge radio-screened plugs, in which the radio screen forms an integral part of the plug. These plugs are also available in the different threads.

Marconi's Wireless Telegraph Co., Ltd., has not taken a stand, but is represented by the radio equipment in the Bristol Blenheim bomber. This equipment includes a Marconi 170 watt combined medium and short-wave transmitter, type AD.37, with a type AD38 superheterodyne receiver, and a direction-finder, type AD.72. It also includes homing equipment with both visual and aural indication.

Wheels, tyres and brakes are shown by the Palmer Tyre Ltd., the new development of the brake being represented on a demonstration outfit. The brake liner of this slides on to the brake frame without the use of any tools, and a spring return device has been incorporated which precludes any possibility of friction between the brake blocks and the drum when the brake is released. The brake blocks are detached from the expansion bag, so that replacement of the blocks is an easy matter without disturbing the bag.

Short and Mason, Ltd., show panels of aircraft instruments,



The Dunlop Rubber Co., Ltd., is represented at the Paris Show by its associated French company.

altigraphs, "Sestrel" compasses, Brown turn-and-bank indicators, bearing plate and drift indicators, boost gauges and a number of meterological instruments.

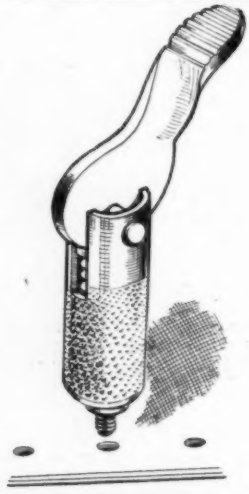
Among the exhibits of Simmonds Aerocessories, Ltd., the most interesting, because this is its first public appearance, is the new Simmonds-Theed vacuum control. This new control is worked from a container in which the vacuum is established and maintained by a connection to the induction system of the engine. From the container, a pipe runs to the working cylinder, the piston of which is, in turn, connected to the trailing-edge flap or whatever other mechanism it is desired to operate. The vacuum control is very light and simple, and it should find a great many applications. At present the working piston is actuated by a spring, but there would, presumably, be no difficulty in making the piston double-acting. Already the Simmonds-Theed vacuum control has been fitted on the Miles Hawk, Hawk Trainer and Whitney Straight. It is now being tested out by Blackburns, De Havillands, Gloster, Saunders-Roe, Shorts, and Westlands.

Neat

A very neat little "gadget" on this stand is the Rifix, a small tool which is used in place of bolts for holding together two or more plates which are to be riveted. The cam-operated plunger is cone-shaped and works inside a split sleeve, the expansion of the sleeve by the plunger locking the plates together. Different sizes are, of course, available for different size rivet holes.

Another Simmond's speciality is the "elastic stop nut," an ingenious locking device which has been used in large quantities in the Short Empire boats.

In addition to their usual range of dashboard instruments, Husun aperiodic compasses, Husun navigation instruments (such as bomb sights, wind gauge bearing plate, and course-



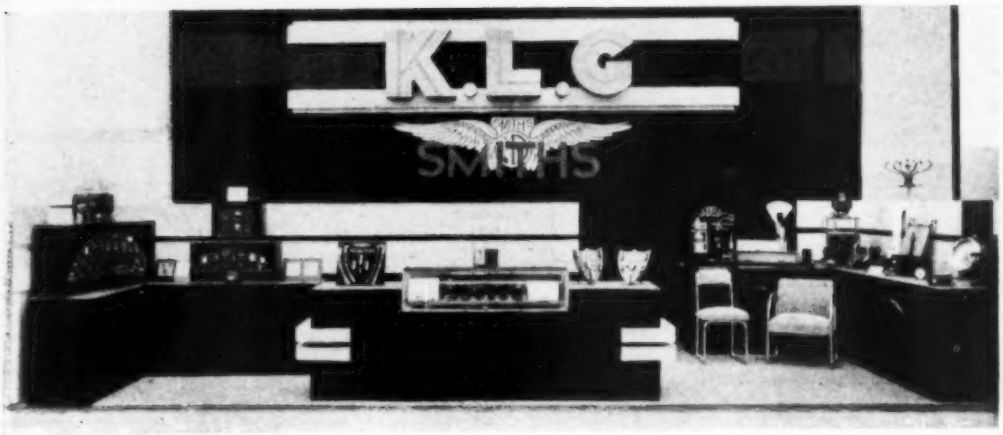
This is the 'Rifix' tool used for holding two sheets together while they are being riveted. The plunger is cone-shaped and when drawn in expands the split sleeve. It is shown in Paris by Simmonds Aerocessories.

and distance calculators), Smith's Aircraft Instruments show K.L.G. sparking plugs, Essex fire extinguishers, Harley landing lights (a new model suitable for thin biplane wings), Frazer Nash wing-tip flares and a number of other things. Of particular interest are, however, the new blind-flying panel, the new Holmes repeater compass, and the bubble sextant. A pilot's comments on these instruments appear on pp. 570-572, so that here it is only necessary to mention their presence on the stand.

Standard Telephones and Cables, Ltd., exhibit an impressive range of radio equipment, including the R.4 ground transmitter, the R.5 receiver, the R.10 transmitter and R.4 receiver, the R.2. aircraft equipment, the R.6 direction-finding and homing equipment, and the R.9 type aircraft equipment with rotary transformer.

(Left) A representative range of Palmer wheels, tyres and brakes. In the foreground is a Dowty internally-sprung wheel of the type used on several British military aircraft.

(Below) Instrument panels, Husun compasses, Holmes repeater compass, bubble sextant, and many other interesting items are on the stand of Smith's Aircraft Instruments.



Air Ambulance for Roumania

THE Roumanian Government has placed an order for a Monospar ambulance laid out on the same lines as those of the now well-known Florence Nightingale. The new machine is to be ready by the end of the year and will carry the complete equipment of a field dressing station as well as blood transfusion apparatus and the latest type of tent for the administration of oxygen. It will be stationed at Bucharest. In addition to duties connected with the Air Force it will also be available for civilian ambulance co-operation.

Gliding in Rhodesia

THE little town of Umtali, on the eastern side of Southern Rhodesia, has formed a Gliding Club. It is the first of its kind in the Colony.

The expenses of members are a £3 entrance fee and a £2 annual subscription.

There are, however, certain cynics who suggest that Umtali has been chosen because this enterprising township has won the St. John Ambulance Competition for the second year in succession.

Forthcoming Events

November 27. Lancashire Aero Club: Annual Ball. Palace Hotel, Buxton.
December 1. R.Ae.S. Students' Section Lecture†: "Stressed-skin Construction," by Mr. C. Moore.
December 1. Colleges of Automobile and Aeronautical Engineering. Annual Dinner and Dance, Grosvenor House, London.
December 3. Herts and Essex Aeroplane Club: Annual Dinner and Dance, Park Lane Hotel, London.
December 3. R.A.F. Flying Club Annual Ball at Grosvenor House, London.
December 9. Royal Society of Arts Lecture: "Artificial Resins," by Mr. H. V. Potter. Royal Society of Arts, John Street, Adelphi, 8 p.m.
December 10. R.Ae.S. Lecture*: "Civil Flying Boats," by Mr. A. Gouge.
December 15. R.Ae.S. Students' Section Joint Lecture with I.A.E. and I.P.T.: "Fuels for Aero Engines," by Mr. C. H. Barton. S.M.M.T., 83, Pall Mall, London, 7 p.m.
December 17. R.Ae.S. Lecture*: "Profile Drag," by Prof. Melvill Jones.
December 18. London Aeroplane Club Dinner and Dance, Park Lane Hotel, London.

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January 14. R.Ae.S. Lecture*: "Magnesium Alloys," by Dr. C. H. Desch.
January 28. R.Ae.S. Lecture*: "Plastic Materials," by Dr. N. A de Bruyne.
February 3. Royal United Service Institution Lecture: "The Anti-Aircraft Defence of Great Britain," by Maj.-Gen. R. H. D. Tompson.
February 5. Cinque Ports Flying Club: Annual Dinner and Dance.
February 11. R.Ae.S. Lecture*: "The Automatic Pilot," by Mr. F. W. Meredith and Mr. P. A. Cooke.
February 17. Royal United Service Institution Lecture: "Air Force Co-operation in Policing the Empire," by Air Comdr. C. F. A. Portal.
February 18. R.Ae.S. Lecture*: "Compression Ignition Engines," by Mr. A. H. R. Fedden.
February 18. Civil Aviation Service Corps Dance, First Avenue Hotel, London.
February 25. R.Ae.S. Lecture*: "Power Measurements in the Air," by Mr. N. S. Muir.
February 26. Brooklands and Associated Clubs: Dinner and Dance, May Fair Hotel, London.
February 26, Hampshire Aeroplane Club: Annual Dinner and Dance, South-Western Hotel, Southampton.
March 11. R.Ae.S. Lecture*: "Airscrew Blade Vibration," by Major B. C. Carter.
April 8. R.Ae.S. Lecture*: "Control Problems," by Mr. A. G. Pugsley.
April 22. R.Ae.S. Lecture*: "American Engine Development," by Mr. G. J. Mead.
August 28 and 29. Cinque Ports Flying Club: International Rally, Lympne.

*All R.Ae.S. lectures take place at the Royal Society of Arts, 18, John St., London, W.C.2, at 6.30 p.m. Admission by ticket obtainable through a member.
†R.Ae.S. Students' Section meetings take place at 7 p.m. in the R.Ae.S. Library.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

AT CALCUTTA: Singapore flying boats of No. 230 (F.B.) Squadron moored on the River Hoogli. They arrived at Selerar station, Singapore, on November 6.

R.A.F. STAFF COLLEGE

The following officers have been nominated by their respective Dominion air boards to attend the R.A.F. Staff Course, 1937:—

Royal Australian Air Force
Flt. Lts. R. H. Simms and V. Hancock.

Royal Canadian Air Force
Flight Lts. A. L. James and W. D. Van Vliet.

Royal New Zealand Air Force
Flt. Lt. E. S. Wallingford.

RESERVE OFFICERS EMPLOYED AS CIVILIANS

It has been decided that officers serving in Class A of the Reserve of Air Force Officers who are employed at R.A.F. stations in a civilian capacity may be permitted to undergo their annual flying training at their stations, provided an aircraft is available for the purpose. Class A is composed of officers who have had previous service with the regular Air Force.

No. 40 (BOMBER SQUADRON) R.A.F.

It is proposed to hold a reunion dinner on the occasion of the coming of age of No. 40 Squadron on February 26, 1937. All past officers who have served with this unit and who are interested are asked to communicate with the Adjutant, No. 40 (B) Squadron, R.A.F. Station, Abingdon, Berks.

MEDICAL AND DENTAL SERVICES DINNER

The fifteenth annual dinner of the R.A.F. Medical and Dental Services will be held at the Café Royal, Regent Street, W., at 7.30 p.m. for 8 p.m., on Friday, December 11. Tickets, 10s. 6d. each, exclusive of wines, may be obtained from the honorary secretary, Sqn. Ldr. R. G. Freeman, Directorate of Medical Services, Air Ministry, 5-6, Clement's Inn, W.C.2.

FORMATION OF STORAGE SUB-UNIT

No. 1 (M.T.) Storage Sub-Unit, formed at Alliance Factory, Western Avenue, Park Royal, London, on October 19. The sub-unit forms part of No. 1 (M.T.) Storage Unit, Hendon, and is directly under the officer commanding that unit for all purposes.

FLYING ACCIDENT

The Air Ministry regrets to announce that Sergt. Fred Charles William Rogers lost his life in an accident which occurred at Steyning, Sussex, on November 17, to an aircraft of No. 46 (Fighter) Squadron, Kenley. Sergt. Rogers was the pilot and sole occupant of the aircraft.

R.A.F. BENEVOLENT FUND

The usual meeting of the Grants Committee of the Fund was held at Iddesleigh House, on November 16. Air Vice-Marshal C. A. H. Longcroft, C.B., C.M.G., D.S.O., A.F.C., was in the chair, and the other member present was Mrs. L. M. K. Pratt Barlow, O.B.E. The Committee made grants to the amount of £325 5s. 2d. The next meeting was fixed for November 30.

AIRMEN PILOTS AND OBSERVERS

An Air Ministry Order—A.263—has the effect of making uniform the rates of pay for airman pilots and air observers irrespective of the trade group from which they are drawn. Hitherto their rates have been based on the pay of the trade group to which they belonged.

The new amounts are the same as those previously paid to airmen taken from Group I and are substantially higher than the former rates paid to men from the other groups. In the case of the latter the pay of airman pilots will be increased by amounts ranging from 1s. to 3s. per day for Sergeants, and from 1s. 6d. to 3s. 6d. a day for Flight Sergeants. Air observers are drawn only from Groups I and II, and the new rates increase the pay of both Corporals and Sergeants of Group II by 1s. per day.

ROYAL AIR FORCE GAZETTE

London Gazette, November 25, 1936

General Duties Branch

The following Flight Lieutenants are granted permanent commissions in that rank (November 17):—F. B. Bristow, C. C. McMullen.

The following are granted short service commissions as Acting Pilot Officers on probation with effect from and with seniority of November 2:—A. F. Barber, H. A. Bethune, T. C. Brock, P. Campbell, J. N. G. Carter, J. F. Chandler, T. V. G. Clarke, W. G. Clouston, B. A. Coventry, A. G. Craig-Brown, G. V. W. Davies, G. F. Dean, D. Devoto, L. J. Fry, J. C. Hamilton, F. B. Harris, F. Hume, G. H. B. Hutchinson, C. S. Kearey, J. C. G. Macnab, G. R. Magill, J. E. Mahony, D. P. Marvin, D. C. Mauger, J. A. Meade, D. S. Munro, J. B. Murray, T. G. Pace, E. J. C. Richardson, G. S. P. Rooney, H. S. Shaw, G. Smith, R. E. G. Van der Kiste, A. D. Watson, N. V. B. Wilmshurst, G. F. Witney.

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—F. C. de la P. Beresford-Peirse, I. G. Mackay, E. D. MacK. Nelson, R. G. Coventry (October 1); H. D. U. Denison (November 1).

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—G. A. Kitching (October 3); P. Fleming, H. L. Dawson (October 16); W. W. Loxton (October 30).

Flt. Lt. J. H. Woodin is placed on the half-pay list, Scale B, from October 20 to October 23, inclusive. Cdr. G. F. Renwick, R.N., Flying Officer, R.A.F., relinquishes his temporary commission on return to Naval duty (November 2).

The short service commissions of the following Acting Pilot Officers on probation are terminated on cessation of duty on the dates stated:—A. R. Cooper (November 5); N. Barker-Simson (November 8).

Chaplains Branch

The Rev. C. D. Fay relinquishes his short service commission on completion of service (November 9).

Commissioned Signals Officer

W/O. T. Wilson is granted a permanent commission as Flying Officer on probation with effect from November 4 and with seniority of October 26, 1936.

Errata

In the *Gazette* of November 10 the name of Ralph Best should be deleted from among the Acting Pilot Officers on probation confirmed in rank and graded as Pilot Officers, under the date September 16.

In the *Gazette* of November 10, notification concerning Lt. G. K. Martyn, R.M., Flight Lieutenant, R.A.F., for July 2, 1936, read July 2, 1934.

COMMISSIONED ENGINEER OFFICERS

The following Warrant Officers are granted permanent commissions as Flying Officers on probation with effect from and seniority of October 26:—E. T. McKeown, R. Best.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

J. M. Wintour (Lieut., R.N., Retired) is granted a commission as Flying Officer in Class A (November 17); F/O. S. M. Thomas relinquishes his commission on completion of service and is permitted to retain his rank (September 15).

The following relinquish their commissions on appointment to permanent commissions in the Royal Air Force (October 19):—F/O. J. E. Innes-Crump, F/O. J. D. Ronald, Pilot Officer on probation D. G. Simmons.

The notification in the *Gazette* of June 23 regarding F/O. H. W. R. Banting is cancelled.

SPECIAL RESERVE

Medical Branch

F/O. A. C. Fraser, M.R.C.S., L.R.C.P., resigns his commission consequent on the conversion of the Special Reserve to the Auxiliary Air Force (May 1).

AUXILIARY AIR FORCE

General Duties Branch

No. 500 (COUNTY OF KENT) (BOMBER) SQUADRON.—F/O. A. Andrew is attached to the Royal Air Force for a period of one year (August 16).

No. 611 (WEST LANCASHIRE) (BOMBER) SQUADRON.—F/O. J. H. Little is transferred from No. 601 (County of London) (Fighter) Squadron (October 1).

Accountant Branch

No. 604 (COUNTY OF MIDDLESEX) (FIGHTER) SQUADRON.—C. R. Griffiths is granted a commission as Pilot Officer (October 13).

Medical Branch

No. 503 (COUNTY OF LINCOLN) (BOMBER) SQUADRON.—A. C. Fraser, M.R.C.S., L.R.C.P., is granted a commission as Flying Officer with effect from May 1 and with seniority of February 12.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Air Commodore.—A. W. Tedder, to Headquarters, R.A.F., Far East, Singapore; on appointment as Air Officer Commanding vice Air Comdre. S. W. Smith, O.B.E., 11.11.36.

Group Captain.—I. T. Lloyd, to R.A.F. Station, Pembroke; to command, 4.11.36.

Wing Commanders.—H. O. Long, D.S.O., to No. 206 (G.R.) Squadron, Bircham Newton; to command, 5.11.36. F. J. Vincent, D.F.C., to R.A.F. Station, Wyton; to command, 5.11.36.

Squadron Leaders.—F. H. Shales, to No. 218 (B) Squadron, Upper Heyford; to command, 2.11.36. S. D. Macdonald, D.F.C., to No. 4 Flying Training School, Abu Sueir, Egypt; for duty as Chief Flying Instructor, 31.10.36; W. R. Day, to Headquarters, No. 11 (Fighter) Group, Uxbridge; for Signals duties vice Sqn. Ldr. R. G. Hart, M.C., 14.11.36. R. H. Carter, to No. 60 (B) Squadron, Kohat, India; to command vice Sqn. Ldr. J. Silvester, 16.10.36. H. M. Groves, to Headquarters, No. 23 (Training) Group, Grantham; for Personnel Staff duties vice Flt. Lt. A. V. Hammond, 2.11.36. E. H. M. David, to No. 7 Flying Training School, Peterborough; for flying duties in Advanced Training Squadron, 2.11.36.

Flight Lieutenants.—R. J. A. Ford, to Experimental Section, Royal Aircraft Establishment, South Farnborough, 9.11.36. R. F. Gandy, to Headquarters, No. 23 (Training) Group, Grantham, 2.11.36. A. T. Monks, to R.A.F. Station, Finningley, 9.11.36. A. P. F. M. Berkeley, to Directorate of Operations and Intelligence, Air Ministry, 5.11.36. H. P. Jenkins, to R.A.F. Station, Farnborough, 9.11.36. S. H. C. Gray, to No. 3 Flying Training School, Grantham, 9.11.36. N. D. Crockart, to No. 7 Flying Training School, Peterborough, 9.11.36. A. R. G. Bax, to No. 11 Flying Training School, Wittering, 9.11.36. P. A. Hunter, M. H. Rhys, W. P. J. Thomson, to R.A.F. College, Cranwell, 9.11.36. G. A. C. Johnston, J. O. Willis, to No. 1 Flying Training School, Leuchars, 9.11.36. G. F. Wood, to No. 6 Flying Training School, Netheravon, 9.11.36. C. S. Byram, to No. 9 Flying Training School, Thornaby, 9.11.36. G. W. Montagu, to No. 10 Flying Training School, Tern Hill, 9.11.36. P. H. Hamley, to No. 3 Flying Training School, Grantham, 2.11.36. A. McKee, to No. 3 Flying Training School, Grantham, 2.11.36. R. E. de T. Vintras, to No 66 (F) Squadron, Duxford, 1.11.36. R. S. Howe, to No. 11 (B) Squadron, Risalpur, India, 1.10.36. W. D. Anderson, D.F.C., to No. 5 (Army Co-operation) Squadron, Chaklala, India, 18.10.36. P. S. Blockey, to No. 60 (B) Squadron, Kohat, India, 19.10.36. W. J. Craig, to No. 28 (Army Co-operation) Squadron, Ambala, India, 1.10.36. E. C. Hudleston, to No. 1 (Indian) Group Headquarters, Peshawar, India, 26.10.36.

Flying Officers.—J. R. L. Rumsey, to No. 49 (B) Squadron, Worthy Down, 14.11.36. H. V. Hoskins, to No. 2 Flying Training School, Digby, 9.11.36. E. R. Bitmead, to No. 6 Flying Traning School, Netheravon, 5.11.36. J. H. Becher, to No. 9 Flying Training School, Thornaby, 29.10.36. R. M. Bradley, to R.A.F. College, Cranwell, 9.11.36. R. H. Young, to No. 6 Flying Training School, Netheravon, 9.11.36. D. R. Keiller, to No. 8 Flying Training School, Montrose, 9.11.36. J. C. Evans, to No. 5 Flying Training School, Sealand, 9.11.36. W. B. Fleming, to No. 8 Flying Training School, Montrose, 9.11.36. F. W. Hilton, to No. 9 Flying Training School, Thornaby, 9.11.36. C. C. House, to No. 27 (B) Squadron, Kohat, India, 5.10.36.

Pilot Officers.—B. B. Jupp, P. D. D. Carlton, A. Hibberd, T. F. D. Morgan, H. W. Tennant, and J. S. Tupholme, to No. 22 (B.T.) Squadron, Donibristle, 2.11.36. J. R. Maling, to Aircraft Depot, Karachi, India, 8.10.36. C. M. Lester, to No. 22 (T.B.) Squadron, Donibristle, 30.10.36. K. G. Stodart and N. M. Hall, to Station Flight, Mildenhall, 3.11.36.

Acting Pilot Officers.—The undermentioned are posted to R.A.F. Depot, Uxbridge, on appointment to short service commissions, as Acting Pilot Officers, on probation with effect from 2.11.36:—A. F. Barber, H. A. Bethune, T. C. Brock, P. Campbell, J. N. G. Carter, J. F. Chandler, W. G. Clouston, T. V. G. Clarke, B. A. Coventry, A. G. Craig-Brown, G. V. W. Davies, G. F. Dean, D. Devoto, L. J. Fry, J. C. Hamilton, F. B. Harris, F. Hume, G. H. B. Hutchinson, C. S. Kearey, J. C. G. Macnab, G. R. Magill, J. E. Mahony, D. P. Marvin, D. C. Mauger, J. A. Meade, D. S. Munro, J. B. Murray, T. G. Pace, E. J. C. Richardson, G. S. P. Rooney, H. S. Shaw, G. Smith, R. E. G. Van Der Kiste, A. D. Watson, N. V. B. Wilmshurst, and G. F. Witney.

The undermentioned are posted to No. 9 Flying Training School, Thornaby, with effect from 31.10.36:—L. H. Baker, W. B. Baxter, A. R. H. Beauman, J. N. Bell, J. C. H. Blake, E. D. Chantler, E. G. F. Chivers, K. B. Corbould, C. T. V. Craxton, J. W. B. Davis, B. O. Dias, J. W. Fordham, J. A. Ingram, R. H. James, B. R. Kerridge, F. L. Litchfield, D. H. Lowe, A. McPherson, C. Murray, J. R. S. Romanes, E. N. Ryder, J. H. Sanderson, M. H. A. Scott, G. E. Thompson, R. H. Thompson, A. L. Vipan, E. G. Winning, and R. S. C. Wood.

Acting Pilot Officers.—The undermentioned are posted to No. 5 Flying Training School, Sealand, with effect from 31.10.36:—D. I. Rogers, A. J. Mould, H. R. MacD. Beall, E. D. Godfrey, J. G. McGrail, N. H. Brace, R. A. Holloway, D. R. Hoar, W. B. Smith, A. Simpson, R. T. Chisholm, D. P. W. R. Robinson, C. G. Saunders, T. H. T. Forshaw, M. H. Roth, A. R. R. Gifford, R. D. Williams, T. W. Storey, H. E. Hopkins, H. J. Seagrim, J. T. L. Shore, D. L. R. Halliday, C. A. Wallis, E. T. Watson, and M. J. Earle.

Commissioned Engineer Officers

Flying Officers.—E. T. McKeown, to R.A.F. Station, Finningley. R. Best, to No. 6 Flying Training School, Netheravon. Both on appointment to permanent commissions as Flying Officers, on probation with effect from 26.10.36.

Commissioned Signals Officer

Flying Officer.—T. Wilson, to R.A.F. Reception Depot, West Drayton. On appointment to a permanent commission as Flying Officer on probation with effect from 4.11.36.

Accountant Branch

Flight Lieutenant.—B. G. Drake, to R.A.F. Station, Upper Heyford, 4.11.36.

Medical Branch

Wing Commanders.—F. J. Murphy, to Headquarters, R.A.F., Middle East, Cairo, Egypt; for duty as Deputy Principal Medical Officer (Hygiene), 12.10.36. W. F. Wilson, M.C., to No. 4 Flying Training School, Abu Sueir, Egypt; for duty as Senior Medical Officer, 12.10.36.

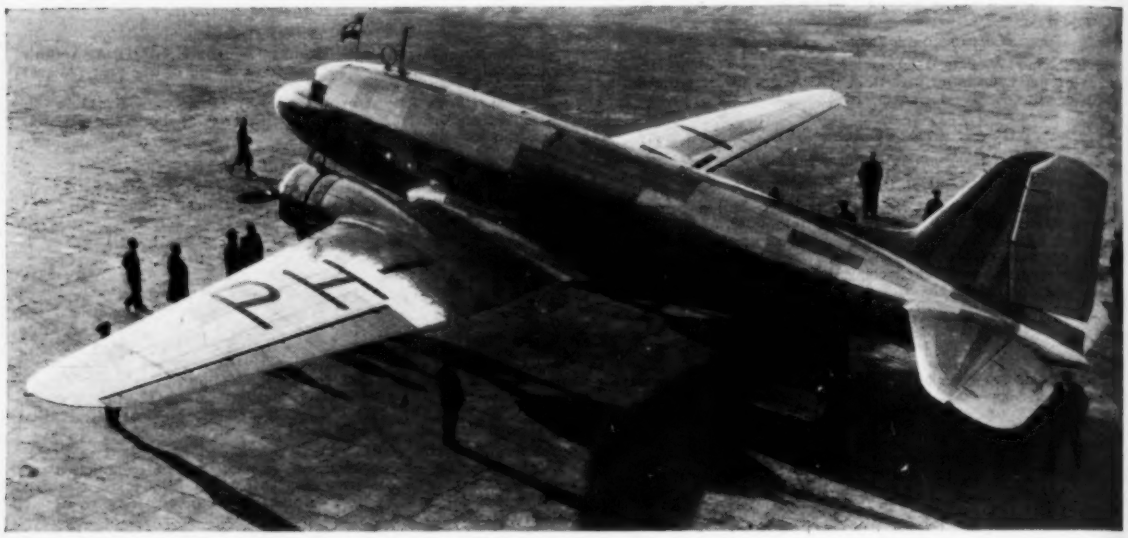
Flight Lieutenant.—O. S. M. Williams, to R.A.F. Station, Lympne, 4.11.36.

Chaplains Branch

Revd C. J. F. Gilmore, to R.A.F. Station, Northolt; for duty as Chaplain (C. of E.) at Northolt and Ruislip, 4.11.36.

COMMERCIAL AVIATION

AIRLINES — AIRPORTS



SHADOW AND SYMMETRY : The smooth lines of the Douglas D.C.3 are well shown in this *Flight* photograph of K.L.M.'s *Ibis* taken at Croydon last Saturday. Another photograph appears on page 568 of this issue.

THE WEEK AT CROYDON

Cure for Winter Depression : Fog Experiences : Ancient Monuments—and Things

LAST week's weather consisted for the most part of rain and fog, but it did not stop many of the air services. After a clammy, dank, chill-sodden and depressing week, everybody would have been the better for an experience I had last Friday, when business called me to the Continent. I did not travel by boat, for that is always silly—and doubly damp and clammy.

Four minutes after leaving Croydon I found I had gone to a better world—and that, moreover, without any awkward questions at the Golden Gate. We first climbed through what (seen from above) looked like a solid, dazzlingly white floor into sunshine which struck hot through the cabin window, and blue sky such as one had forgotten. I am quite sure that in the future we shall have machines built mainly of plastic glass to take us up out of winter weather for a few hours of sunlight and, incidentally, pure air. Often, when approaching Croydon in fairly clear weather, you can *see* the brownish-grey atmosphere you are going to be compelled to breathe as soon as you reach *terra firma*.

Saturday was fine, luckily for K.L.M., who demonstrated the new Douglas D.C.3, which, I am told, earned golden opinions. So many people turned up, despite the cold, that there were three Douglas machines flying until dark in order not to disappoint them—the D.C.3 and two D.C.2s. Sunday morning brought fog, in spite of which the D.C.3, with Commander Scholte in control, left at precisely 8.0 a.m., having on board Mr. A. Plesman, K.L.M. managing director. Another air notability seen at Croydon at about the same time was Mr. Juan T. Trippe, president of P.A.A.

Sunday's fog played some queer tricks, and at one time was only a few feet high, though thick as mud. Herr von Ribbentrop's special Junkers Ju.52 came along with His Excellency aboard, and the pilot, they say, landed by obtaining a sight of *Scylla's* top wing, which was sticking up through the fog. The Ambassadorial machine has the fine old-fashioned Nordic registration letters D-AMMY, and "Damme, sir!" says the Ju.52, "Ambassadors can't be kept waiting, so here I am, exactly to schedule, fog or no fog." As a matter of fact, the pilot, once he had landed, could not find his way to the tarmac, and had to use D/F. on the ground, whereby the control tower guided him across the wide open spaces.

Newspapers took various photographs of machines in the fog, but most impressive to the uninitiated would have been one of a perfectly blank, grey wall of fog with one or two splashes of light, like liver spots, on it, denoting the really rather remarkable fact that machines were being led from the tarmac to the white take-off line by ground staff, and that once there and pointing the right way, they were taking off into about the same visibility as a microbe has when swimming around in a glass of milk.

There is a great story from Paris of an Imperial Airways' stowaway who somehow evaded the official check-up and seated himself firmly in the machine, wrapping his arms and legs round the chair and refusing to move. Finally, he had to be forcibly removed by the Le Bourget police. A more interesting piece of freight last week was a rare orchid which came by K.L.M. from Bandoeng to London in six days. Orchids are not popular as air freight, possibly because you have to apply for a licence to the Phytopathological Society before importing them, and, as most people can neither spell nor pronounce the word, they say, "Let's not import any," and leave it at that.

A *Notice to Airmen* warns these gentry that a certain

Lincolnshire church tower may be seriously affected by vibration, and requests them not to fly near it. Should not this also apply to Croydon's main building? Whenever certain aircraft fly over it those who sit in managerial chairs (brooding over high rentals) are awakened from their day-dream by lumps of plaster which descend from the ceiling on to their furrowed brows.

Considerable interest was aroused by the appearance, performance, and interior comfort of a Czechoslovakian registered Lockheed Electra, rumoured, quite incorrectly, to be the property of Lord Beaverbrook, who, nevertheless, has one on order, I believe. This one belongs to the Bata Shoe Company. The Electra was flying on Saturday afternoon at the same time as the D.C.3 and the other two K.L.M. Douglas machines—and then came *Scylla*, majestically riding the skies!

A. VIATOR.

AMERICA'S LATEST TRANSPORT

K.L.M.'s First Douglas D.C.3 at Croydon : Quieter and Quicker than its Smaller Predecessor

A TYPE already in active use on American Airlines' night transcontinental service, the first D.C.3 to be seen at Croydon was brought over by K.L.M. last Saturday and is actually the first of a fleet of ten ordered by this progressive concern. At least five will be used on the Batavia service and this machine, the *Ibis*, has been put on the London-Amsterdam-Berlin run.

In day-travel form the D.C.3 has seating accommodation for twenty-one passengers and the machines for K.L.M. use are slightly modified as far as the operational section is concerned. Behind the first pilot's chair is a third seat for the use of a radio operator and/or navigator, with a chart table and compass, while the radio equipment is on the starboard side, behind the second pilot's seat. Otherwise the machine is almost standard, though there is a Telefunken ultra-short-wave receiver and its visual indicator.

The major differences between this machine and its predecessors will be gathered from a perusal of the accompanying table, the latest "G" type of Wright Cyclone engine delivering a maximum of 1,100 h.p. as compared with 750 h.p. given by the Cyclones in the D.C.2. Structurally, the machines are almost identical and in appearance on the ground may only be distinguished by fin and fuselage differences. The undercarriage of the latest machine is, however, operated hydraulically by means of engine driven pumps and not by hand.

It is curious to think that only two years ago the Douglas was frankly disbelieved and discredited by many of our self-appointed experts. Probably the Short Empire boat has done more than anything to show our own people what can be done to-day—provided that the order is sufficiently large. Douglas should by now have sold some seventy machines or more.

To some extent, now, the D.C.3 is itself discrediting even the D.C.2. It is undoubtedly quieter, though faster, and the passengers are made more comfortable with the help of the most ingenious seats which were described by "A. Viator" in last week's issue. These seats are arranged in a triple row of seven, with one gangway. Therein lies our only criticism. The inner of the two passengers sitting together on one side of this gangway can see a little out of both sides—but precious little out of either. At its best the low-wing monoplane does not give the passengers too good a view and there may eventually be a reverse swing of the pendulum of design towards the high-wing type.

THE DOUGLAS D.C.3.
Two Wright Cyclones of 1,100 h.p. each.

	D.C.3.	D.C.2.
Maximum speed (7,000 ft.)	213 m.p.h.	190 m.p.h.
Cruising speed (10,000 ft.)	180 m.p.h.	175 m.p.h.
Ceiling on one engine	7,500 ft.	5,700 ft.
Rate of climb	950 ft./min.	950 ft./min.
Ceiling	23,900 ft.	20,000 ft.
Range	2,000 miles	1,100 miles
Weight empty	15,260 lb.	12,300 lb.
Useful load	8,740 lb.	6,044 lb.

However, this criticism brings us to the most significant feature of modern air travel. The passenger does not *want* to look out—he is, in fact, usually asleep. Once the Cyclones have been throttled back, and the airscrew pitch changed, travel in the D.C.3 is the most restful affair that can possibly be imagined; the reflections from the wide spread of metal-covered wing and from the discs of the slow-running airscrews would send even the most wide-awake European dictator into a pleasant slumber. Furthermore, in modern air-travel, above the clouds or the mist-smoke of industrial areas, at 10,000ft. or so, there is nothing to be seen—nothing, that is, except the indescribable beauty of the upper world itself. The rubbish-dump (or lunatic asylum) into which we have made our earth is no longer of any possible consequence.

The *Ibis* actually came over on regular service, carrying the managing director of the company, Mr. A. Plesman, who very generously devoted his afternoon to the job of assisting the London staff in dealing with the mass of interested people. Mr. Plesman, incidentally, considers the London "station" to be very nearly the most important in Europe.

British Airways' Electras

IT transpires that the order placed by British Airways is for four Lockheed Electras, to be delivered in February and to be used on the Scandinavian mail service. This foreign purchase is, of course a purely temporary measure.

Meanwhile, with the loss of one of the two remaining F.12s and the temporary grounding, for night work, of the 86As, British Airways will have a difficult job to keep this service in regular operation. Incidentally, on Sunday and Monday this week, this company was the only one, we were told, still operating regular services to and from Paris. Gatwick was better off than Croydon in the matter of weather.

Gatwick To-day

IN comparison with the airport which was seen by the multitude at the official opening the Gatwick of to-day is a very tidy affair. The short-range Marconi D/F equipment has been in full working order for three weeks and, as already reported, the airport has its own controlled zone bordering on that of Croydon. The Lorenz blind-approach equipment is almost ready, only the outer marker beacon being missing for the moment. This approach is actually made from east to west, over the railway line, and there will eventually be a run of about 1,400 yards in that direction.

Remembering the clay subsoil Gatwick has stood up remarkably well to the recent heavy rains, none of the actual landing area showing any signs of weakness, though some water, of course, remained on the undrained portion between the runways.

The Blackpool Accident

AFTER taking off in fog conditions at Blackpool last Friday a Northern and Scottish Airways' machine touched a hangar, crashed and caught fire. Mr. C. O'Connell, the pilot, and Mrs. E. A. Miller, the only passenger, lost their lives, and four other machines were destroyed. It is probable that the machine swung a little during the take-off and that the hangar proved to be an unexpected obstacle.

The Irish Base

LITERALLY and metaphorically Col. Lindbergh dropped out of the sky into Dublin during last week. He was accompanied by representatives of the two companies interested in the operation of the Transatlantic service from the base at Kilconry, County Clare—Mr. Juan T. Trippe, President of P.A.A., Mr. J. C. Cooper, of the same company, and Mr. G. E. Woods Humphery, managing director of Imperials. Col. Lindbergh, of course, is technical adviser to P.A.A., and he consulted with the chief technical adviser of the Army Air Corps, Commandant G. J. Carrol, who represents the body which acts as technical adviser to the Department of Industry and Commerce.

The whole party went on to Kilconry and Rynanna, Col. Lindbergh flying his own Miles Mohawk, to inspect the airport site and the work which had been started thereon. This is Mr. Trippe's second visit to Ireland this year.

A minimum of two flights in each direction per week will be undertaken during the initial stages, and the United Kingdom will provide both the chairman and managing director of the Empire Company's board.

Commercial Aviation

SIMPLIFIED INTERCEPTION

A New Method of Solving a Problem Often Faced by Charter Pilots

TO many pilots, and particularly those who have been or are with the Fleet Air Arm, the problems involved in interception might be considered as simple ones. This article is primarily for the benefit of newcomers, but the method used might be adopted by any charter pilot. Although it is obviously impossible to please everyone, we hope to publish from time to time articles of a similar nature covering the many and varied specialised problems involved in air navigation. These will appear either in the Commercial Aviation section or elsewhere, according to the particular scope of the subject matter.

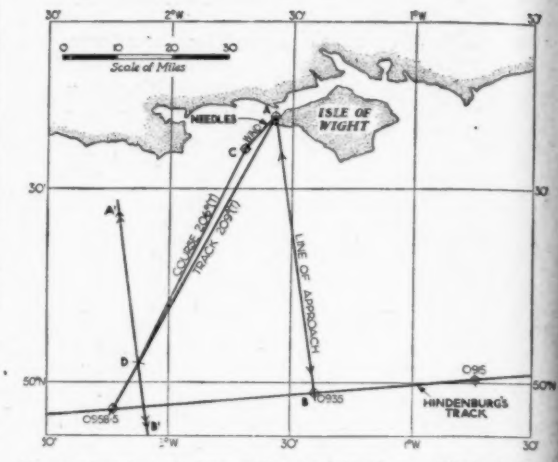
A QUESTION involving interception is nearly always included in the second-class navigators' examination, and the method described below provides a simple and accurate method of solving such problems.

It is realised that experts will find the methods which are already in use to be equally easy, but it is probable that this will be more readily understood by beginners. Both, of course, are equally accurate. Where a map or chart is to be used to work out the question it is not necessary to use any scale other than the scale of the chart. The method is best described by a worked example.

In this the track and ground speed of the craft to be intercepted are given. The first question in the D.R. and D/F paper of the last second-class navigators' examination is a good example and an abridged version, sufficient to show the method of working, reads:—

"The airship *Hindenburg* is flying down the English Channel, on a true track of 266 degrees, and at a ground speed of 90 knots. You are cruising over the Isle of Wight, hoping to intercept her and obtain photographs. The position of the *Hindenburg* at 0915 is Lat. 50 00.5 N., Long., 00 45 W. Your position at 0935 is midway beween the Needles Lt. and Hurst Pt. Your airspeed is 125 knots; the wind is from 43° (T) at 25 m.p.h. Find the course to steer in order to intercept and the time of interception."

From the data supplied, fix on the chart the position of both craft at the later given time, i.e. 0935 hrs. Call these two points (see accompanying diagram) A (aeroplane) and B (*Hindenburg*), and draw a line to join them. Through B lay off the track of the airship, and measure off along this track a distance for any convenient period of time. The period used will depend upon the scale of the chart, and in this particular example 20 minutes or a quarter of an hour are probably most suitable. The first time scale is used in this case. Through a point on the *Hindenburg's* track, which has just been fixed, draw a line parallel to AB, and call it A¹B¹. From A lay off the wind for the same interval of time, *down wind*, to the point C. With centre C and radius of airspeed for the same interval of time, draw an arc to cut A¹B¹ at the point D. Then C D is the true course to steer, and A D the true track to intercept.



The point of interception is found from A D produced to cut the *Hindenburg's* track, and the time of interception is calculated from the distance between point B and the point of interception.

J. A. MCGILLIVRAY.

The Crawley Accident

ONCE again it appears that an incorrectly estimated position may have caused the loss of valuable lives, though until a thorough investigation has been made and reported it will be possible only to guess at the cause, or causes, of this error. On the Continent a machine was recently lost through the fact that a reciprocal was mistaken for an actual bearing, or *vice versa*—though the Q-code letters for the two are very different (QTE and QUJ)—and this opens up new and somewhat disquieting possibilities of failure.

Flt. Lt. A. P. K. Hattersley

In this case a British Airways Fokker F.12, piloted by Flt. Lt. A. P. K. Hattersley and Mr. V. J. W. Bredenkamp, had been brought into Gatwick under a low ceiling and with bad visibility on radio bearings and was due to land at about 3.40 a.m. The control tower staff heard its engines and the pilot was given "motors south" information. He turned away from the airport, evidently to make a wide circuit and a final approach; nothing further was seen or heard until a machine was sent out at daylight to make a search. The Fokker was found in a wood four and a half miles south of Gatwick; the ground height at that point is some three hundred feet higher than that at the airport. Both the pilots were killed in the crash; the engineer, Mr. G. Blower, was rather severely injured, but the radio operator, Mr. C. V. G. Wheeler, escaped with superficial injuries.

Born in 1900, the late Flt. Lt. Arthur Patrick Kilvington Hattersley had, at the time of his death in the Crawley accident last Thursday, reached the front rank of transport pilots.

His experience in this branch of flying began in 1931, when he was a pilot with Northern Air Lines. Later he flew for Commercial Air Hire and took early morning newspaper machines over to Paris for this company. Last year he joined British Continental Airways, with whom he was chief pilot.

Flt. Lt. Hattersley served in the R.F.C. and R.A.F. in 1917 and 1918, with the South African Air Force between 1923 and 1926, and, on his return to this country, was an "A1" instructor at the Central Flying School until 1931.

Mr. V. J. W. Bredenkamp was also a pilot with B.C.A. until the amalgamation of the two concerns. Previously he had served with the Royal Air Force and his rank was Flight Sergeant when he left the Service.

Japan in China

ONE of the first steps in Sino-Japanese commercial co-operation in North China has been the formation of the Huitung Aviation Co., which is to run air services between Dairen, Chinchow, Tientsin, Pekin, Kalgan and Jehol. Chinese and Japanese interests have provided equal capital, there is a Chinese president and a Japanese vice-president. Japanese machines and pilots are, it is understood, to be employed.

Air France and North Atlantic

THE French Air Ministry has been considering the various claims of the flying boats which are being built for the non-stop North Atlantic service to be operated by Air France, and have decided to give precedence to the type which the Latécoère Company is building. The construction of this machine, which is derived from the famous *Lieutenant de Vaisseau Paris*, will now be accelerated.

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